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THE OPTIMUM HUMIDITY FOR MENTAL WORK

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Most people have only a vague idea of the hygienic significance of humidity in the air of the home or the schoolroom. Much of the recent literature on the subject is likely to leave one with confused or erroneous ideas.

On the one hand are those who apparently have found the key to human happiness and efficiency in an optimum humidity. On the other hand are those who generalizing hastily from the investigations of the New York Commission on Ventilation conclude that apart from unusual conditions the humidity in the air of a schoolroom is of minor importance.

An ardent representative of the former class is Mr. Watt who has discussed at length the relation of humidity to health; and on the basis of his observations in the Graham School in Chicago condemns the dry atmosphere of the ordinary schoolroom and insists in the most emphatic language upon the need of a proper degree of moisture. In a personal letter a few years ago he wrote:

"We have humidified the air in all regular rooms and reduced the temperature to 62 with everyone comfortable and enthusiastic over it. This is the greatest thing in education at this minute. The hot dry air of ordinary schools makes catarrh, pneumonia, tuberculosis, grippe, dyspepsia, general debility, headache and torpor. By injecting steam into the tempered air chamber we lower the danger of colds and make the teachers who formerly were chilly in 70 satisfied with 62. More than satisfied."

Watt apparently would make a lack of humidity responsible in large degree for the moral and mental defects of humanity in general. In his book he has chapters on "American dry rot;" "The steam heated woman;" "Dryness as a cause in falling off in church attendance." Of his own experience in Chicago he says:

"We avoid hundreds of daily headaches, we cure stupidity, we permit clearness of thought, we have cut down the number of cases of office discipline more than 75% since we turned on the steam." (13)

On the other hand the New York Commission (10) from studies of the physiological condition and ability to do intellectual work as gauged by standard psychological tests under varying conditions of humidity, reported no appreciable results. The subjects of this experiment, it is reported, worked naturally and they were no less efficient and showed no poorer control under the excessively dry conditions than under the more favorable conditions. The subjects did not feel uncomfortable, and there seems to have been no real physiological disturbance, because the tests of pulse and temperature gave negative results.

Between these extremes are conflicting reports of many observations of the effects of different conditions of humidity. Obviously it is desirable that further investigations be made. Meanwhile it seems possible to come to closer quarters with the problem and to get a clearer view of the significance of the known facts.

The problems of temperature and of humidity are inseparably connected. Air, using the word as we usually do, always contains a certain amount of moisture. It seldom contains all it can hold. When it does it is said to be saturated. Speaking from a more strictly scientific point of view, Dr. Wilson says:

"The expression, 'capacity of air for moisture' is misleading. A better expression is, capacity of space or vapor for moisture, because the presence of air in space has nothing whatever to do with the capacity of the space for moisture, the only effect of the presence of air being to retard the diffusion of moisture within the space." (*Science*, 1911, p. 152.)

Absolute and relative humidity are distinguished. The absolute humidity is the amount of moisture actually contained in a given space or atmosphere. The relative humidity is the ratio of this actual humidity to the possible humidity at saturation for the given temperature and pressure; and it is reckoned in the percentage which the absolute humidity is of

the total possible humidity. That is, an atmosphere of a given temperature would contain 100 parts of water at the saturation point. We find it does contain 75 parts, then it has a relative humidity of 75%. The warmer the air, the greater the amount of moisture it can hold; hence for a given percentage of relative humidity, the warmer the air the greater is the amount of moisture it contains, or the greater the absolute humidity. Thus the relation of the relative humidity to the temperature is an important one, and absolute humidity as well as relative humidity has hygienic significance.

To understand the hygienic significance of the humidity of the air, it is necessary to keep in mind that the primary need for ventilation is to remove superfluous heat from the body. Recent investigations have emphasized this. In the now familiar experiments of Paul in Flügge's laboratory, while he remained for four hours breathing the same air over and over again when the temperature and humidity were low, with the temperature above 70° F. and the humidity above 72%, serious symptoms appeared and he was on the verge of collapse in 15 minutes. When in this condition he put his head out of the cabinet and breathed fresh air it did him no good, since an increase of the body temperature was apparently the cause of the symptoms. In the high temperature of some schoolrooms and public halls, as suggested by the experiments by Paul, probably an abnormal increase of the body temperature, what Paul called *Wärmestauung*, occurs. The serious effects of this were demonstrated by Paul's experiments, and ordinary observation shows the same. Where people are crowded into an enclosed space, fainting not infrequently occurs, and this is apparently often due to the abnormal increase of the body temperature. In such cases what happens is probably this:—The increased temperature produces an increase in metabolism and the oxygen supply is not equal to the demand; hence the disastrous results. (2, p. 57).

Lee (8a) has brought together a large number of facts bearing on the effect of increased temperature and increased humidity, and forms the following conclusion:—"From these various observational and experimental data it may be inferred, if not with certainty at least with a high degree of probability, that the subjection of a body to an external temperature and humidity sufficient to raise the internal temperature to a pathological degree causes metabolic changes, the nature of which is not yet known, but which interfere profoundly with the normal working of internal mechanisms."

Lee also recalled the fact that Alexander von Humboldt more than 100 years ago observed that heat increased the

action of various chemical substances on certain forms of living matter such as the heart and the motor nerves. Many investigators have studied this and it is recognized as a general law that at a higher temperature the action of poisons is more intense. It has been suggested that this law applies to the effect of fatigue toxins. Patrizi suggests that this is the reason for the great susceptibility of the human muscles to fatigue when subjected to hot baths. In the case of excessive temperature and humidity we have the fatigue toxins as well as an overheated body, and in proportion as the internal temperature rises the toxicity of the fatigue substance is more and more increased.

Huntington has given a similar explanation of the effects of excessive temperature. He says:

"Physiologists are not yet fully agreed as to the cause of the phenomena shown . . . although there is little doubt as to the general facts that they imply. One hypothesis may be briefly stated. According to Pütter's summary, the most probable explanation is that activity goes on increasing according to the ordinary chemical law until it becomes so great that the organism is not capable of absorbing the necessary oxygen. That is, at a low temperature the creature easily gets what oxygen it needs, and gives it out again in the form of carbon dioxide or of other oxidized products which remove the waste substances from the body. As the temperature rises, the normal increase in chemical activity takes place, the animal is still able to get rid of all its waste products, and thus its life processes are strengthened. With a further rise of temperature a change sets in. The chemical processes which break down the tissues of the body become still more active, but the supply of waste products to be eliminated by oxidation becomes so great that they cannot all be removed. This is because in every organism there is a distinct limit to the amount of oxygen which the creature can mechanically convey to different portions within a specified time. If the supply of oxygen is not sufficient to oxidize all the waste products, some of these will remain in the system. They act as poisons. Their first effect is to diminish the organism's activity. If they accumulate to too great an extent death ensues." (7, p. 107.)

What happens in such extremes of temperature and humidity suggests the point of view for considering ventilation. Dr. Lee sums up the facts, as he sees them, as follows:¹ "When an individual is subjected to an atmosphere that is charged with an excessively high temperature and high humidity, his bodily temperature is raised, his working power

¹ *Am. Jour. of Public Health*, 1912, p. 870.

becomes limited, and there is an early oncoming of fatigue. In addition to the normal fatigue substances there are present other substances, products of an abnormal metabolism, perhaps of increased protein disintegration, which likewise act as fatigue substances. Both the normal and the pathological fatigue substances act toxically to diminish the activity of the tissues, and such fatiguing action is rendered greater by reason of the abnormally high internal temperature that is present."

Thus we see the serious results that occur when the temperature of the body is raised above normal, when there is a storing up of heat in the body, as in Paul's experiments in the glass cabinet. Nature has a very elaborate mechanism for maintaining the body at normal temperature. When there is excess of heat the blood is rushed to the surface and cooled. When one is cold, the blood is withdrawn from the surface and heat is conserved. As Sherrington has put it:

"The temperature of the blood as a whole will depend on how large a fraction of it is cooled by streaming through the skin. The regulation of that quantity is a main means of regulating the deep temperature. It is common experience that we flush after entering a warm room. That is, the blood-vessels of the skin dilate. A larger portion of the total blood streams through the cool skin-zone of the body; the escape of heat from the body is more free; this counteracts the tendency for the internal temperature to rise in the warm surrounding. The skin becomes warmer but the internal temperature remains unaltered, or often is a little lowered from over-compensation."

Thus it is vitally essential that the superfluous heat be eliminated from the body. The success or the failure of the body in accomplishing this purpose depends as well on the humidity of the external air as on its temperature as will be apparent from a little consideration.

The humidity of the air has two opposite effects. The first effect of increased moisture in the air is to increase the conductivity of the air for heat and thus to favor the transfer of heat from the body to the air. This is a cooling influence. The other effect of moisture in the air is to check the evaporation of moisture from the body, and thus to check the elimination of heat from the body. This we may refer to as an important heating influence. Whether the moisture in the air serves to cool the body or to heat the body depends on the relation of these two different effects of humidity. At a temperature below 60°, since under ordinary conditions of rest there is practically no perspiration, the dominant if not the exclusive effect of humidity in the air is to increase the conductivity of the air

for heat and hence to cool the body. Above 70° the dominant effect of moisture in the air is likely to be the heating effect decreasing the evaporation. This more than offsets the effect of the increased conductivity of moist air, hence it tends to heat the body.

The greater absolute humidity for a given relative humidity at the higher temperature is also an important factor in relation to respiration; but the relation between the cooling influence by conduction and the heating influence from the checking of evaporation seems to be the prime factor. As Professor Hough says:²

"Humidity influences the output of heat from the body in two very different ways: It increases the conductivity of the atmosphere for heat—a cooling influence; and it interferes with the evaporation of perspiration—a heating influence. What the net result will be depends on which of these influences of humidity is predominant. Below 70° the second, or heating, effect drops out, because so little perspiration is then secreted, and a high degree of moisture chills the skin, as shown by the familiar effect of an east wind in winter along our northern Atlantic coast. Above 70° , on the other hand, because conduction is slower, it becomes necessary to evaporate perspiration and at these temperatures humidity heats the skin. Between these lower and higher ranges of temperature, there is a neutral region at which high humidity has comparatively little effect. This region is about 68 or 70° . We have only to appeal to our own experience to see that high humidity chills the body at 65° , while it is hardly noticeable (in the absence of muscular activity) at 70° ."

But in another important way the humidity of the atmosphere affects the elimination of heat from the body, namely, by its effect upon the amount of moisture eliminated by the lungs. Normally in an ordinary atmosphere the body throws off a large amount of heat from the lungs in respiration. The importance of the absolute humidity in relation to health depends upon the fact that it conditions the amount of moisture taken from the body in the process of respiration. Harris and Benedict³ estimate that under the conditions of their experiments with human subjects at rest, 10% of the total heat is lost by evaporation of water from the lungs while 12.3% is lost by evaporation from the skin. Air taken into the lungs contains varying amounts of moisture depending upon the temperature and humidity of the atmosphere. The amount of moisture taken from the body in the

² *Amer. Jour. of Public Health*, 1910, p. 268.

³ *A Biometric Study of Basal Metabolism*, p. 197.

processes of respiration equals the amount given off by the lungs in expiration minus the amount taken into the lungs by inspiration. That is, if the air is cold and dry, as in this climate usually in the winter, little moisture is inhaled and a relatively large amount of moisture is given off from the lungs. If the air is hot and humid, very little moisture is eliminated from the lungs.

In other words, the moisture taken from the lungs is equal to the difference between the absolute humidity of the air inspired and that of the air expired. If the absolute humidity of the air breathed is low, a large amount of moisture is taken from the body in the process of respiration. If the absolute humidity is high, little is taken from the body.

With a moderate temperature and humidity an adult gives off from the lungs, according to Rubner, in one hour:

Rest	17g
Deep breathing	19g
Reading	28g
Singing	34g

In case of an individual for whom these figures represent the facts the amount taken from the body is this amount minus whatever is inspired.

With an atmosphere nearly saturated and a moderately high temperature, say 80°, the amount of moisture taken from the lungs is correspondingly reduced, and such an atmosphere is oppressive. A person ill with fever in a hot muggy day can be greatly relieved by letting him breathe air that has been forced through a large piece of ice by an electric fan. By this means the temperature of the air is reduced far below the point of precipitation and the absolute humidity correspondingly reduced.

Other conditions being constant, upon the *relative humidity* depends the amount of moisture evaporated from the skin. Hence this is an important factor in determining the temperature of the body. With a temperature of 85°F., for example, and a relative humidity of 90%, the body is surrounded as it were with a steam jacket and it is hard for it to rid itself of its superfluous heat. Thus Paul in his experiments with the glass cabinet found, as already noted, that with a temperature of 60°F., if the humidity was not more than 47% to 72%, he could remain for hours in the cabinet without discomfort; but with a humidity of 72% to 92% and a temperature of 68° to 86°, serious symptoms appeared in 15 minutes. But there was another interesting feature of this experiment; when on the verge of collapse, he started an electric fan, and the disagree-

able symptoms disappeared; for this stirred up the air and increased the evaporation from the body. (2, p. 57.)

Thus the absolute necessity of eliminating the superfluous heat from the body and the need of a suitable humidity of the atmosphere in order to favor the regulation of the body temperature give us the primary reasons for ventilation. In spite of all our lack of knowledge in regard to the problems of expired air there is apparently a practical consensus on this point as regards ventilation. The following is a good example of the opinions held.

Professor C. E. A. Winslow writes: "The chief factors for air conditioning for the living machine, *which in most cases far outweigh all other factors put together* are the temperature and humidity of the air." And again he says: "The sensations experienced in a badly ventilated room and the serious effects which such a room exerts upon health and efficiency are primarily due to the warmth and stagnation of the air and to its high humidity." (14, p. 828.)

Thus humidity is an essential point to be considered in ventilation. Ordinarily the air of inhabited rooms must be changed to keep the humidity at an optimum. To determine the optimum humidity for intellectual work is not an easy task. The chief factor to be considered is probably the effect on metabolism, appearing temporarily as comfort, permanently in an effect on health.

Several investigations have been made to determine "sensible" humidity. These indicate that the variations within the limits of comfort are rather wide. Rubner (12) made experiments with a man in the respiration chamber for the purpose of solving this problem. The general results were as follows: At low temperature, 14-15°C. (52 to 59F.), dry air is more agreeable than moist. Between 24° and 29°C. (75 to 84 F.) dry air appears cooler than moist. High temperatures are not uncomfortable if the air is very dry. Visible sweat begins at 29C. (84F.) with a relative humidity of 22%. A relative humidity of 96% with a temperature of 24C. (75F) is unendurable for any length of time.

Observation too, shows that many persons are uncomfortable in a dry atmosphere. Lack of humidity is supposed by many to produce nervousness. If we pass beyond the mere question of comfort we have little direct evidence of what constitutes the optimum. But from our present point of view of the physiological significance of humidity in the air we may consider some of the important investigations.

Huntington (7, p. 85) studied the relation of the humidity to the efficiency of factory workers. He found efficiency at

a minimum in January and July and at a maximum in May and November. He notes that a sharp distinction should be made between the humidity of the outside air and that indoors. In his own study he did not find that humidity was responsible for fluctuations except as it was influenced by temperature. The inside humidity he thinks is an important factor in causing the low efficiency of mid-winter; but the average humidity of the outside air from season to season does not, he thinks, vary in such a way as to cause maxima in May and November, and minima in January and July.

Huntington reported that in spring and fall with temperature ranges from freezing to 70° with an average of 50° the best work is performed with a relative humidity of 75%. Neither the wet days nor the dry days are the best. A hot damp day, as everybody knows, is debilitating. The majority of the dampest days in summer are comparatively cool and the coolness counteracts the humidity and efficiency increases, hence Huntington concluded that with an average temperature of 65° a relative humidity of about 60% is desirable, and he says: "The most unmistakable feature of the curves as a whole is that they show a diminution of work in very dry weather." (7, p. 87).

Bearing still more directly on our problem are the investigations of the New York Commission on Ventilation. In their earlier tests the Commission studied the effect of humidity only incidentally; but no influence appeared. The general result as reported by Prof. Palmer was as follows: (9, p. 56)

"The effect of air conditions on mental proficiency was observed by giving the subjects standard psychological tests, such as adding columns of figures, mental multiplication, naming opposites of words, typewriting and cancelling numbers. The average scores in these various tests were found to be about equal regardless of the temperature or the absence of ample ventilation. Even a hot moist room, 86 degrees, which caused profuse perspiration and very positive discomfort, failed to lower the standard of efficient work. The scores fell off perceptibly, however, in the hot room, when the subjects were allowed to work or not as they pleased. No such change was noted when the air supply was reduced to a minimum. In fact, the average result of daily votes in one series indicated a greater degree of comfort with no air supplied at all than on the days with ample ventilation. The room temperature in both cases was kept at 68° ."

The investigations by the New York Commission were made upon over a hundred different subjects, men and women,

working for periods approximating a day or half a day of ordinary factory work under carefully controlled atmospheric conditions in specially constructed experimental rooms at the College of the City of New York. Physical and mental tasks of various kinds were given and careful physiological and psychological observations of the bodily condition and the efficiency in both mental and physical work were made. As Dr. Winslow sums up the results: (14, p. 829)

"These experiments showed that stale rebreathed air containing 20 parts or more of carbon dioxide and all the organic and other substances commonly present in such air had no harmful effect on any of the physiological conditions studied, nor on the power or inclination to do mental or physical work, nor even on the comfort of the subjects as indicated by their average vote,—provided the temperature was not allowed to rise as it would generally do in such a room under ordinary conditions. There was, however, a slight but distinct diminution in the appetite for food in the stale air."

"The power to do either mental or physical work when concentrating for a short period under a strong stimulus was not diminished in these experiments even by the extreme condition of 30° C. (86° F.) with 80 per cent relative humidity. This coincides with practical experience, for we are all aware that heat, unless very extreme, is no hindrance to absorbing intellectual work and no bar to a good game of tennis."

"On the other hand warm air, whether stale or fresh, produced distinct and clearly marked physiological reactions. At a temperature of 24° C. (75° F.) with 50 per cent relative humidity the rectal body temperature was .2° C. higher and at a temperature of 30° C. (86° F.) with 80 per cent relative humidity, it was .5° C. higher than at 20° C. (68° F.) with 50 per cent relative humidity. The reclining pulse rate was 5 beats higher and the standing pulse rate 12 beats higher at 24° C. (75° F.) the reclining pulse rate 8 beats higher and the standing pulse rate 17 beats higher at 30° C. (86° F.) than 20° C. (68° F.)."

In the special investigation of the effects of humidity tests were made of addition, aiming, hand steadiness, tapping, type-writing, arm steadiness, mirror tracing, industrial fatigue, reflex wink, and eyelid tremor. The tests were made twice or three times a day with a temperature of 75°F. and 50% of relative humidity and 75°F. and 20% relative humidity.

By these tests of nervous and motor control, and by the more strictly intellectual tests no influence of excessive dryness during the two weeks' exposure, or during the working day could be detected.

Classes also were arranged at each end of the building, those at one end having a dry air, those at the other, a moist air. That is, in the words of the report, "Several classes at one end of a floor were subjected to moist atmosphere, and classes at the other end to naturally dry air." The pupils in these classes were of the same grade of mentality and physical and social status. (10, p. 14)

The physical condition of the children and the percentage of attendance showed no difference in the two groups of rooms. And on the basis of similar mental tests the experimenters concluded that no appreciable difference was found.

The experimenters did not conclude from these results that ventilation is an unimportant matter. Dr. Stecher writes in closing her monograph as follows: (10)

"Still, our finding that individuals put under certain controlled conditions react or fail to react in certain ways is by no means to be taken as sanction for all sorts of uncomfortable ventilation conditions. It must be remembered that in isolating the factor of humidity, we did not attempt to reproduce the conditions that go to make up a crowded, ill-smelling and excessively hot room. The very fact that the method of ventilating the experimental chamber produced a normal amount of air movement tended to alleviate the discomfort that would ordinarily be felt in a closed room under a 75°, 20 per cent condition."

It should be noted that these experiments give results which apply of course only within the range of humidity tested, and for the length of time the experiment was continued and the other conditions of the investigation. They tested low humidity, that is, of 20% as compared with what was deemed an optimum humidity, namely 50%. Further experiments are especially desirable to test an optimum humidity of 50% compared with a high humidity, say of 85 or above and also with a higher temperature, say a temperature of 75° such as is often found in schoolrooms and offices.

These experiments conducted by the New York Commission and reported by Miss Stecher were carried out with great care to control conditions, to give suitable instructions, to make the mental conditions favorable by arousing interest and the right attitudes in the subjects. They did not, however, concern all the important psychological factors involved. Especially is this true as regards suggestion. It would seem especially desirable that further investigation should be made with the special aim of determining the influence of this distinctly psychological factor in conditions where changes of humidity are concerned.

That many people are specially susceptible to suggestion from air conditions is shown by many observations and by the reports of many students. Note especially the comfort which many persons take from having a bowl of water or the like on the radiator in a hot room, and further, the very beneficial results reported by many from the use of some of the patent devices for moistening the air. That these favorable

results are due to suggestion rather than to the water evaporated is indicated in the first place by such experiments as those of Professor Loveland which showed that the ordinary radiator pan or vessels of water placed about the room change the humidity of the air only a fraction of 1%.

The observations made by Watt (13) and other enthusiasts cannot be doubted. But the psychologist naturally inquires if the good results of increased humidity reported were not in part due to suggestion. With the enthusiasm of their teacher the students in Watt's school would probably do better work when he, as he says, "turned on the steam," whether this were done literally or figuratively.

In their earlier tests the New York Commission studied the effect of morbidity only incidentally, but no appreciable effect of changes in humidity were observed.

The results found by the Commission should be considered in connection with such studies of the health of school children as those made by Dr. Josephine Baker (1) in the New York schools, who found an enormous increase in respiratory disorders in mechanically ventilated schoolrooms as compared with the open-window naturally ventilated rooms. The chief defect of the investigations of the New York Commission as described in these preliminary reports appears to be that they have not yet extended their study to the deeper effects of variations in air conditions on metabolism and the permanent health of the workers. That these deeper effects are the significant ones for hygiene is indicated not only, as we have seen, by the physiological effects of excessive heat and humidity, but is also suggested by the significant statement of the Commission that a loss of appetite was noted among their workers in unfavorable air conditions.

The outstanding facts emphasized by recent investigations are the following:

- (1) The effect of bad air upon health and efficiency is due to physical conditions of heat, humidity, and lack of cutaneous stimulation rather than to chemical or bacteriological factors. The outcome of many recent investigations is to emphasize this point.

- (2) The stagnant air in unventilated rooms apparently exerts an influence upon health and efficiency. In such an atmosphere there is a lack of normal cutaneous and nervous stimulation; and apparently, as indicated by the health of patients in hospitals and pupils in public schools, the health as well as the comfort of the occupants of rooms with stagnant air is distinctly affected. Moving air from open window

ventilation or even from the presence of an electric fan is distinctly beneficial, providing a healthful stimulus.

(3) Recent investigations, especially experiments carried on by the New York Commission on Ventilation, indicate surprisingly little effect upon the ability to do mental work from lack of ventilation. While excess of temperature affects the physiological functions, as already noted, the ability to do mental work seems to be practically as great with excess of humidity, and even of temperature, under the conditions of the experiments performed by them. The unfortunate results of bad air, apart from the direct physiological effects of overheating seem to be due largely to the mental attitude, distraction, and in case of many persons, the great discomfort, caused by suggestion, association, or conditioned reflexes, that occur under such conditions. In other words, the mental factor likely to be present in badly ventilated rooms seems to be much more important than is ordinarily supposed.

(4) The recent investigations corroborate and emphasize what has long been known, that the CO_2 and other poisonous chemical substances present in bad air have little if any appreciable effect.

(5) In order to get to close quarters with the effects of bad ventilation, further studies should be made of the deeper physiological effects upon metabolism and the general health, especially from continuous work in bad air conditions.

PRACTICAL SUGGESTIONS

While we do not know very accurately about the matter, there is good reason to believe that a low humidity as well as a high humidity are both injurious to the health. The schoolroom problem is not a simple one. Besides the weather conditions and the heating and ventilating we have to consider the children as heat and moisture producing organisms.

Selter ⁴ assumes that an increase of humidity due to the children in a schoolroom cannot be avoided. One school child gives off per hour about 20 gr., an adult about 60 gr. of water in the form of watery vapor. This would amount in case of 50 children and a teacher to 1060 gr. or 5 gr. per cubic meter of the schoolroom. If we assume a temperature of 18°C . and a humidity of 50% at the beginning of the instruction then the moisture would rise at the end of the hour to 83% on the supposition that the temperature remains constant at 18° . If one would use the humidity as a gauge for reckoning the amount of air to be added, then in the case of cold outdoor air one would need to add only a very little air by ventilation in

⁴ Handbuch, p. 92.

order to keep the humidity from going above 60%, but in case of a high external temperature one would need to add very much air by ventilation. For example in case of an outdoor temperature of 5°C. and 80% of humidity changing the air once would be enough. In case of an outdoor temperature of 12° and 80% of humidity one would need to change the air twice; with an external temperature of 14° sufficient air could not be added to keep the humidity below 60%.

Selter's figures represent at most only one situation, but they illustrate a factor in the problem often neglected.

In regard to this whole matter, also, it should be remembered that an optimum humidity is merely one among many essential conditions; and great care may well be taken in statements concerning the humidity of the air in a schoolroom. The humidity is an essential factor in determining the optimum temperature; suitable temperature and humidity are inseparably connected as the primary ends of ventilation; and all the factors involved in the problem should be considered.

In the present condition of our knowledge it appears that with too dry an atmosphere injury is done to the throats and noses of some at least of the children; that in hot weather too moist an atmosphere checks the normal evaporation and elimination of heat from the body and is depressing. Until further studies have been made, schoolroom air with a temperature of 68°F. to 70°F. should have a relative humidity of 45 to 60%. A temperature of 65 to 68 with a humidity of 50 to 60% would probably be better.

Practical schemes for increasing the humidity of the air of schoolrooms are apt to fail because few people realize the great quantity of water that must be added to the air of a room when it is dry in order to produce an optimum humidity. This is well illustrated by experiments cited by Dr. Bruner.

"A few years ago some careful experiments on humidifying air were made by Professor Loveland at the University of Nebraska. These covered thirty days. Two seven-room houses, alike in construction and each heated by a hot-air furnace of the same make, were selected for experimentation. It was found that to raise the relative humidity of one 10 per cent above the other, as indicated by the hygrometer—i. e., from 20% to 30%—it was necessary to evaporate sixty-four gallons of water daily. It was further demonstrated that the ordinary furnace or radiator pan, or vessels of water placed about rooms, affect the humidity so little that it is not registered by the hygrometer. . . Most persons will testify to feeling a considerable difference in the character of the air as a result

of such evaporating devices, but the difference is unquestionably psychological rather than physical."⁵

To show the amount of moisture necessary to keep the air of a large building at a relative humidity of 50% in dry weather, Dr. Bruner gives the following example:

"The air in the American Bell Telephone building at Boston is kept at a relative humidity of 50% by injecting into the entering hot-air current a jet of steam; 675 gallons of water (twenty-two barrels) in the form of steam is required for this purpose every ten hours."

Many practical experiments in schoolrooms have shown that in the northern parts of this country in the winter months the air is apt to be very dry, and that pupils are comfortable at a lower temperature than the usual standard of 70° F. if the humidity can be increased. An interesting example of these studies may be cited.

Professor Brown⁶ of the Worcester Normal School made tests a few years ago in various rooms in that building, and he reported as follows:

"Last year a jet of steam was turned into the ventilating shaft of the Normal School building and by regulating the supply the humidity of the main hall was raised to between 50 and 60 per cent. The increase of water vapor thus obtained allowed us to live in a temperature of from 64 to 66 degrees in comfort. On one or two occasions the curious condition resulted that the hall, perhaps moistened to the point of enervation, seemed comfortable at 61 degrees when a recitation room in which no moisture entered was reported cold at 65 degrees."

The condition of the atmosphere in most school rooms in this part of the country during the winter season is very dry. Mr. Brown says, comparing them to a desert:

"Now when we consider that the dry region of Asia, the Trans-Caspian Desert, has a range of humidity from nineteen to forty-five per cent; in Africa, Tripoli has a humidity of thirty-three per cent in August; and the Kufra Oasis, Sahara, twenty-seven per cent; Lahore, India, thirty-three per cent; and in our own country the dry Death Valley, California, has for five months a mean of twenty-three per cent, and Pueblo, Colorado, a mean annually of forty-six per cent, we realize that a schoolroom at thirty-seven per cent is not better than a desert."

On the other hand, we may perhaps from the results thus far obtained conclude that the actual ability to do mental work in such processes as adding is not materially decreased during a short period by working in an unduly high temperature and high humidity; but the amount of work done under ordinary conditions, where the subjects are prone to give way to their feelings; that is, the work done under ordinary school-

⁵ Bruner, Proc. N. E. A., 1911, p. 894-5.

⁶ Worcester Bulletin, Nov. 16, 1912.

room conditions, is likely to be greatly decreased by a temperature and humidity that vary considerably from the optimum.

While the results of experiments seem to show no effect of dryness of the atmosphere down to 20% humidity on the amount of work that can be done, there does seem to be, on the other hand, a good deal of evidence that such conditions of the air create discomfort, and especially is it true at the other extreme, that great discomfort is caused by extreme humidity. Most people are so governed by their feelings that this discomfort is likely under ordinary conditions to decrease one's efficiency for work, however true it may be that under laboratory conditions one may be able to do as much work as usual.

Whatever the possibilities of doing a normal amount of work under adverse air conditions, in the ordinary work of the school it is desirable that children should be comfortable; and there are plenty of opportunities for developing will power and a wholesome attitude of meeting difficulties without resorting to an excess of temperature or of humidity. It is desirable that the developing brain of the child, the most marvelous and most complicated machine of which we have any knowledge, should do its work at least with conditions that do not tend to distraction. The habits of work formed under such conditions are better than those formed where the mental work is done with discomfort. Again in the practical work of the school, when discipline goes wrong and children misbehave or become nervous, the teacher should seek for the cause, and one of the first things to do is to look at the thermometer and note the other air conditions. It is usually better to improve the discipline by letting in fresh air than by the use of sarcasm or the rod.

At first sight it is difficult to understand why some people are so seriously affected by excess of humidity in the atmosphere. The sticky humid days of midsummer are disagreeable to anyone; but in case of some individuals they are the cause of much lassitude and depression. Probably some children form conditioned reflexes to a humid atmosphere as a conditioned stimulus. If this occurs we have a natural explanation of the idiosyncracies of certain nervous people to the weather. The way such reflexes might be formed is obvious.

Suppose a child happens to have a slight physical disorder, indigestion, headache or the like, on a muggy humid day. The indigestion is the cause of the headache and other uncomfortable symptoms. Naturally enough in case of nervous children a single experience of this kind might be enough to cause the association of the humid weather with the indigestion as a conditioned stimulus; and in case of normal children,

if this experience happened two or three times, the weather condition might naturally become associated with the indigestion, so that thereafter when such humid weather occurred, even without the indigestion, the same physical symptoms of depression, headache and the like might occur as conditioned reflexes.

Probably, however, the excess of temperature does to a certain degree affect the brain directly by causing changes in metabolism. The experiments by the New York Commission strongly suggest that excess of temperature or the bad odors of stale air, or both these together modify the general metabolism, since, as we have seen, these investigators found that by working in bad air and overheated conditions the appetite of their subjects was diminished. Thus, while for the time being no appreciable effect on the working ability was noticed, probably continued work in these conditions would be injurious to the health and decrease the efficiency.

The reason, then, that changes in temperature and humidity have an effect on the mental activity would seem to be three-fold: first, because excess of temperature and humidity affects the general metabolism, and along with this the metabolism of the brain; second, the excess of temperature causes discomfort, distraction of attention, and the like; third, the idiosyncracies of some individuals apparently make them especially susceptible to weather conditions, by suggestion, the forming of conditioned reflexes, or the like.

CONCLUSIONS

The main points in regard to humidity may be summed up briefly as follows:

1. The higher the temperature the greater the amount of moisture that a given atmosphere or a given space can contain.
2. What constitutes an optimum humidity depends upon the temperature.
3. Absolute and relative humidity are to be distinguished. The absolute humidity is the actual amount of moisture contained in a given space or atmosphere, the relative humidity is the ratio of this actual amount of moisture contained in a given space to the possible amount that can be contained at the saturation point, and this is usually stated in per cent.
4. The absolute humidity is an important factor in determining the elimination of heat from the body in the process of respiration, because the amount of moisture taken from the lungs is equal to the amount expired minus what is inspired at the given temperature and humidity.

5. The relative humidity is important for health because it also is an important factor in determining the elimination of heat from the body.

6. The humidity in the atmosphere has two different effects. For example, an increase in the humidity increases the conductivity of the air for heat and thus favors the transfer of heat from the body—a cooling effect. On the other hand an increase in the humidity decreases the evaporation from the body, which is of course a heating effect. The actual effect of the humidity of the air at any given moment will depend on the relation of these two factors. This fact explains many of the puzzles in regard to humidity.

7. In this part of the country the air in most schoolrooms in the winter is usually too dry.

8. Observation seems to have shown also that injurious effects upon the mucous membrane of the throat and respiratory tract result from continued breathing of an extremely dry atmosphere, and that such conditions may cause inflammation and irritation of the throat and bronchial tubes. The question of causal relation here, however, has not been adequately studied.

9. A very high humidity with a low temperature makes one chilly. With a high temperature it is oppressive. With a temperature even of 80° and 100% of humidity it seems almost intolerable.

10. Probably there is an optimum humidity for the best physiological condition and for efficient mental work, although this probably ranges within rather wide limits.

There is no consensus in regard to the optimum humidity. Rubner, who has studied the matter for years, advises: At 20 C, 30% — 60%; Uffelmann, 40% — 75%. In this country we may well adopt a relative humidity varying from 45% — 65% as representing the optimum. The range of comfort is very wide, perhaps from 45% — 75%.

11. The organism apparently has great power of adaptability to changes in the temperature and humidity of the air.

12. Changes in humidity are likely to have an exaggerated effect upon some individuals on account of suggestion.

13. It should be kept in mind that the special significance of an optimum humidity comes from its connection with the conditions of temperature. The investigations by the New York Commission concern merely humidity with what may be considered a fairly optimum temperature.

14. Although the experimental evidence is small, it seems clear that an optimum humidity is an important condition of efficient brain activity.

15. Until further investigations are made, the optimum humidity for a schoolroom with a temperature of 68 to 70° would seem to be a relative humidity of 45 to 60%.

16. The experimental evidence, especially that furnished by the experiments of Lehmann and Pedersen, indicates that there may be optima for different occupations.

17. Most of the devices for humidifying the air of a separate room are of little value because they supply too little moisture.

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RELATION OF INITIAL ABILITY TO THE EXTENT OF IMPROVEMENT IN CERTAIN MATHE- MATICAL TRAITS

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INTRODUCTION

The purpose of this study is to determine whether initial ability in certain traits has any relation to the extent of improvement an individual may make after he has had a period of training and practice.

An attempt is made to answer the following questions.

1. How is initial ability related to the extent of improvement an individual may make during a practice period?

2. Is it possible to approximate the level of attainment a group should reach after a prescribed amount of training; that is, is it possible to foretell how much improvement a group should make if given a stated amount of training for a stated period of time?

3. Do any limits appear in the amount of improvement that may be made under class training?

The writer became interested in this problem while supervising grade work in the public schools. In making use of the various tests, standard and otherwise, in checking the results of teaching in arithmetic, it became obvious that the various groups tested were making gains of different amounts. Within a group, it was noticed that individuals differed in the amount of improvement made. The question arose, "What pupils make the greatest gains? Is there a certain type of pupil upon whom training and practice have an especially marked effect?" An attempt to answer these questions from educational literature is at present impossible as only a few brief studies bearing upon these questions have been published. Opinions are rife, but these do not agree among themselves. They vary all the way from the confident assertion that improvement will vary directly with the amount of initial ability, to the equally confident assertion that the reverse is true. Some of this divergence is no doubt due to the fact that the term 'initial ability' is used in a varying sense.

In this study, initial ability is understood to refer to the amount of work of a specific type that an individual is able to do in a given time, such measure being made at the beginning of a practice period. This ability is a complex of native

ability and training, but no attempt was made to seek a measure of these factors independent of each other.

STUDIES MADE

In this investigation five studies were made as follows:

1. Study of abilities among children of the 4th and of the 5th grades of the public schools in two figure additions, and in two figure multiplications.

2. Study of the abilities of pupils in the four fundamentals of arithmetic, and in copying figures, in the 5th, 6th, 7th, and 8th grades of a private school system.

3. Study of abilities among children of the 6th, 7th, and 8th grades of a public school system in the fundamentals of arithmetic and in problems in reasoning.

4. Study of the abilities of college freshmen in college algebra.

5. Study of the abilities in the four fundamental operations of arithmetic among grade children of the 4th, 5th, 6th, 7th, and 8th grades of a public school system.

These studies were all made under different circumstances and are reported separately. Each is complete in itself, and is an observation upon the subject under investigation. Each adds a bit of testimony in answer to the questions stated on page 330. It was the purpose of the writer to approach these questions from several angles, and note the results, and if possible draw conclusions.

The general plan adopted in the investigation was to test rather thoroughly the group under consideration in particular traits, and then, after a period of study and practice and drill, to follow with a similar test and note the progress made during the interval.

After the first test in each study, an array was made of the measures obtained, rated according to the several abilities of the pupils, ranging from the best to the poorest. The measure or score used was the number of correct exercises completed during the time of the test.

For the purpose of study, this array was divided at its middle point into two groups. The gains made by these groups were then compared. The gain for each group was obtained by taking the average score made by the group in the first test, and subtracting that from the average score made by the same group in the later test. In most cases, as a further check upon the effect of initial ability, the array was divided into three groups of about equal size, and a study made which compares the progress of the three groups.

It must be understood that this division was made only of

the results obtained, and as far as the pupils themselves were concerned, no such divisions existed at any time. The pupils did not know whether they were in the upper division or the lower division, or that any division existed.

It might be questioned whether the slow pupil gets the same amount of practice in a given time as does the one who works more rapidly, but as far as the time element is concerned, and as far as presenting the instruction is concerned, each pupil had the same opportunity and the same amount of teaching.

STUDY I

Tests in Addition and in Multiplication

Sixty-one pupils of the fourth and the fifth grades of the Caledonia, Minnesota, Public Schools were given tests in addition and in multiplication of two figure combinations selected by chance. In selecting these combinations, six sets of numbers, from 0 to 9, were placed in a box and were drawn out by two's. The combination was recorded and a second draft made. When five such combinations were drawn, these numbers were returned to the box and the process repeated. Two hundred and forty such combinations were printed on a sheet nine by twelve inches, and were ready for the pupil. He did not need to write anything but the result.

The initial test covered five minutes of time. The results were tabulated, only correct answers counting toward the score, and the result was divided by five to reduce the score to a one minute basis.

On the day following this initial test, ten minutes of daily drill were given upon exercises precisely like those used in the test. The drill was special in that it was given at a particular time in the day, was given preference to the other school work, and was personally conducted by the writer. Daily reports were made to the pupils showing progress made, errors were corrected, and the need of both speed and accuracy was emphasized. The contest feature entered into this study as the three highest scores in each grade, in each fundamental, were announced each day. This stimulated the efforts of those pupils who were able to get on the honor roll each day, but it did not assist the others who did not receive favorable mention.

This kind of drill was given daily in each grade, in each fundamental for a period of six weeks. At the end of this time, a test similar to the initial five-minute test was given to each grade in each fundamental. An array was then made of the scores obtained in the first test, and the median ability in

each fundamental was noted. The pupils who made an initial score above this median constituted a group for study. Those that were below the median constituted another group. The gains made by the pupils in each group were averaged.

The pupils were also divided into three groups, taking each tertile as a separate group. The gains of each of these groups were also computed. Table I shows the average gains made by these various groups. Low. $\frac{1}{2}$ means those grouping themselves below the median; Upp. $\frac{1}{2}$ those making a score above the median in the first test. Low. $\frac{1}{3}$, Mid. $\frac{1}{3}$, and Upp. $\frac{1}{3}$, show the various groups under the division into three parts.

TABLE I

	Low. $\frac{1}{2}$	Upp. $\frac{1}{2}$	Low. $\frac{1}{3}$	Mid. $\frac{1}{3}$	Upp. $\frac{1}{3}$
4th Add.	9.8	10.5	7.2	13.4	10.0
5th Add.	8.2	12.6	7.6	10.5	13.2
4th Mul.	8.2	11.8	7.2	9.8	12.5
5th Mul.	5.1	11.5	6.1	6.5	12.7
Av.	7.8	11.8	7.0	10.1	12.1

The figures in this table represent the gain in the score, or in exercises done, in one minute, or in one-fifth of the time of the five-minute test.

It will be observed that those making the highest initial score have made the best gain. Those scoring above the median in fourth grade addition, made an average gain of 10.5 exercises. Those scoring below the median in this same grade and ability, made an average gain of 9.8 combinations. When divided into thirds, the gains range with the initial ability with the exception of in the middle $\frac{1}{3}$ of the fourth-grade addition.

Table II. gives for reference the medians of the various grades and groups.

TABLE II

	All	L $\frac{1}{2}$	U $\frac{1}{2}$	L $\frac{1}{3}$	M $\frac{1}{3}$	U $\frac{1}{3}$
4th Add.	19.0	15.7	23.3	14.6	19.0	25.0
5th Add.	25.5	20.4	32.5	18.8	25.8	34.8
4th Mul.	16.0	11.0	19.4	9.3	15.8	20.5
5th Mul.	23.0	16.4	28.5	13.8	22.8	30.5

These medians are for the first test. The medians for the second test may be obtained by adding the gains given in Table I to the medians given in Table II. The gains represent a high percentage of the initial score.

These results compare rather favorably with those of Dr. Thorndike as reported in *School and Society* for March 20, 1915. In a substitution test, in which initial ability was measured, and afterward fifty minutes of practice and drill given, a table was made of the gains for different groups. His upper group made a gain of 7.4 points, while the lower group made a gain of 6.8 points.

STUDY II

Abilities as shown by the Courtis A Tests

During the school year 1910-11, the Courtis A Tests, Nos. 1, 2, 3, 4, and 5, were given twenty-two times in a private school in one of our largest east central cities. The intervals between the tests were somewhat regular. The tests were all given by the same examiner, with automatic timer, and about the same time in the day. Every effort was made to keep the conditions uniform. A limited amount of drill was given during the year, although it was not so intense as that given in the study reported in Study I.

From these twenty-two tests the writer selected six for tabulation, as a basis for this study. These were selected so that three came during the first half of the year, the first selected being the first given at the opening of school; and three during the latter part of the year, the last test selected being the one given at the close of the school year. A twenty-third test, which is the seventh in this study, was given a year after the twenty-second one.

The grades tested were the 5th, 6th, 7th, and 8th. There were 89 pupils in all whose records were complete enough to be used in this study. A very few of these did not take the last test mentioned.

An array was made by grades of the scores made in the first test. The median score was selected in each grade, and this served as a dividing point for grouping the students. Those scoring above the median constitute an upper group, and those scoring below the median constitute a lower group. The average gain of each group for each fundamental, and for copying figures, was computed for each grade for each series of tests using the first as a basis. Table III shows the number of cases and the median for each grade in addition, and the gains made by each group in each test after the first test.

TABLE III

ADDITION

Grade	No.	Med.	1-2	1-3	1-4	1-5	1-6	1-7
5th	16	27	Upp.	6.50	11.38	9.38	16.63	24.57
			Low.	5.88	6.63	7.75	13.88	17.00
6th	17	38	Upp.	5.00	4.88	6.88	11.25	20.88
			Low.	6.15	8.38	9.63	17.88	26.50
7th	29	40	Upp.	6.47	6.00	4.50	9.38	17.93
			Low.	4.27	6.00	8.68	6.87	21.86
8th	26	57.5	Upp.	2.06	5.38	7.92	6.22	14.54
			Low.	7.06	7.30	6.76	15.22	17.92
Totals and averages	88	40.6	Upp.	5.01	6.91	7.17	10.87	18.53
			Low.	5.84	7.08	8.21	13.46	20.82

The gains of the upper group are written above, and those of the lower group below in each table.

It will be observed that the upper group has made the best gain in 9 cases out of 24, but when the average gains are computed for each test, the lower group makes the best gain every time. This gain varies from .2 of a point to 2.6 points. Table IV shows for subtraction what Table III does for addition.

TABLE IV

SUBTRACTION

Grade	No.	Med.	1-2	1-3	1-4	1-5	1-6	1-7
5th	16	18	Upp.	5.88	8.25	12.38	18.38	22.38
			Low.	10.63	10.50	11.50	19.00	22.63
6th	17	29	Upp.	8.75	9.62	10.13	15.25	19.25
			Low.	7.63	7.75	8.25	18.38	23.00
7th	29	30	Upp.	7.73	9.47	9.67	12.46	22.60
			Low.	6.40	7.93	10.80	13.80	23.86
8th	26	40	Upp.	7.84	9.23	8.77	14.07	17.07
			Low.	9.69	11.61	10.61	13.84	23.54
Totals and averages	88	29.3	Upp.	7.30	8.64	10.24	15.04	19.83
			Low.	8.59	9.45	10.29	16.25	23.26

The upper group makes the best gains only 8 out of 24 times in subtraction, and in the average gains the lower group makes the best gain every time. The difference varies from .05 of a point to 2.4 points. Table V shows these same facts for multiplication.

TABLE V
MULTIPLICATION

Grade	No. Med.			1-2	1-3	1-4	1-5	1-6	1-7
5th	16	11.5	Upp.	7.88	8.63	10.50	19.75	23.50	18.00
			Low.	9.75	9.00	12.64	23.63	24.25	29.67
6th	17	27	Upp.	12.00	13.38	12.01	19.25	21.63	17.25
			Low.	10.25	11.63	15.50	26.25	32.38	18.25
7th	30	29	Upp.	10.93	14.66	14.80	18.53	28.09	23.61
			Low.	9.00	11.66	13.22	15.33	31.53	21.58
8th	26	37.5	Upp.	7.76	13.31	13.31	17.85	18.62	9.00
			Low.	10.61	16.46	17.08	23.85	24.62	20.67
Totals and averages	89	26.3	Upp.	9.64	12.49	12.66	18.85	22.96	16.97
			Low.	9.90	12.19	14.61	22.27	28.20	22.54

In multiplication the upper group makes the best gain 7 times out of 24. In the average gains the lower groups are ahead with one exception, and this time they lack only .3 of a point. They are ahead 5.3 points in other places. Table VI shows the results in division.

TABLE VI
DIVISION

Grade	No. Med.		Division						
			1-2	1-3	1-4	1-5	1-6	1-7	
5th	16	12.5	Upp.	7.53	14.50	12.00	21.63	28.25	18.57
			Low.	9.38	13.00	16.13	21.63	28.13	26.33
6th	17	23	Upp.	9.75	10.28	9.50	15.50	24.13	20.25
			Low.	10.75	14.00	12.63	23.50	33.50	31.88
7th	30	30	Upp.	9.00	12.00	13.33	17.66	23.26	24.00
			Low.	7.33	9.13	12.53	14.93	25.86	28.66
8th	26	45	Upp.	6.11	11.38	8.92	14.61	19.84	13.66
			Low.	11.61	16.15	17.53	21.07	21.84	10.60
Totals and averages	89	27.6	Upp.	8.22	12.04	10.94	17.10	23.87	19.12
			Low.	9.77	13.07	14.71	20.28	27.33	24.37

Again the upper group is ahead 7 times out of 24. In the average gains the lower group is ahead every time. The returns were not complete enough to make a similar table of the results in copying figures.

Thus it is seen from a study of the averages shown in Tables III, IV, V, and VI, that the lower group, or the half with the lower initial ability in the first test, makes the better average gains in all fundamentals in all cases, excepting one, out of 24.

It might be argued that the pupils were not accustomed to taking tests when the first test was given, and therefore it becomes a poor basis from which to compute gains. The writer, to overcome this objection, made an array of the scores made in the fourth test, and from these scores computed the gains made in the 5th, 6th and 7th tests. The pupils were evidently accustomed to taking tests by this time, as that had been preceded by a number of similar tests.

An array was also made of the scores made in the sixth test, and new groupings formed as before, and the gains computed between the sixth and seventh tests.

Table VII shows the medians for the fourth and for the sixth tests in addition, together with the gains made in the later tests upon each of these as bases. The number of cases is given, and the data are given for each grade.

TABLE VII

Grade	No.	ADDITION					
		4 Med.	4-5	4-6	4-7	6 Med.	6-7
5th	16	36	Upp.	4.25	8.75	10.50	43.5
			Low.	6.50	9.50	11.57	
6th	17	45	Upp.	5.88	13.88	16.33	58
			Low.	7.88	14.38	11.33	
7th	29	49	Upp.	-1.13	13.66	14.53	63
			Low.	-3.26	15.00	17.90	
8th	26	64	Upp.	1.77	4.61	6.67	71
			Low.	9.61	12.48	13.67	
Totals and averages	88	48.5	Upp.	2.67	10.10	12.01	57.8
			Low.	5.18	12.84	13.62	

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The lower group makes the better gains in every case excepting 2 out of 16, and in the average gains is always ahead. Table VIII shows these facts for subtraction.

TABLE VIII
SUBTRACTION

Grade	No.	⁴ Med.		4-5	4-6	4-7	⁶ Med.	6-7
5th	16	29.5	Upp.	5.56	10.25	9.67	38.5	1.40
			Low.	6.25	12.75	16.14		3.25
6th	17	37	Upp.	4.38	11.38	18.33	55	5.83
			Low.	10.75	13.75	15.83		3.33
7th	29	40	Upp.	8.00	12.06	15.02	54	-3.15
			Low.	5.13	14.60	15.46		4.77
8th	26	52	Upp.	6.69	5.07	10.50	60	-2.50
			Low.	11.92	14.31	11.50		.83
Totals and averages	88	39.9	Upp.	4.36	9.69	13.38	51.9	.40
			Low.	8.51	13.85	14.73		2.80

The upper group makes better gains 3 times out of 16. In the average gains the lower group is always ahead. Table IX shows the results in multiplication.

TABLE IX
MULTIPLICATION

Grade	No.	⁴ Med.		4-5	4-6	4-7	⁶ Med.	6-7
5th	16	24.5	Upp.	7.50	13.88	10.57	41	-.07
			Low.	15.13	14.50	16.83		.09
6th	17	37	Upp.	7.13	8.13	11.17	54	.50
			Low.	11.25	15.50	10.00		-4.67
7th	30	42	Upp.	5.06	13.06	9.70	61	-15.60
			Low.	2.40	11.08	6.75		-1.85
8th	26	55.5	Upp.	6.00	8.62	5.17	62.5	3.17
			Low.	6.85	7.08	11.80		-5.00
Totals and averages	89	39.8	Upp.	6.42	10.92	9.15	54.6	-3.00
			Low.	8.91	12.04	11.35		-2.86

The upper group makes the best gains 7 times out of 16 in multiplication, but the lower group is always ahead in the average gains. Table X shows the results in division.

TABLE X
DIVISION

Grade	No.	4 Med.	4-5	4-6	4-7	6 Med.	6-7
5th	16	29	Upp.	5.25	12.38	5.83	-7.67
			Low.	10.88	15.88	13.00	.03
6th	17	40	Upp.	4.00	13.75	10.67	-3.67
			Low.	12.50	24.00	21.17	.00
7th	30	40	Upp.	5.06	10.07	8.00	-7.50
			Low.	2.56	15.86	13.13	4.45
8th	26	60	Upp.	4.07	6.46	.50	-8.50
			Low.	6.00	9.00	4.86	-5.00
Totals and averages	89	42.2	Upp.	4.60	10.67	6.35	-6.84
			Low.	7.99	16.19	13.04	-1.13

Only once is the upper group ahead in division, and in the averages the lower group is always ahead. Table XI shows the results for the tests in copying figures.

TABLE XI
COPYING FIGURES

Grade	No.	4 Med.	4-5	4-6	4-7	6 Med.	6-7
5th	16	86.5	Upp.	3.75	-1.13	12.28	5.14
			Low.	14.75	18.50	16.00	24.00
6th	17	100	Upp.	2.38	3.75	8.50	5.33
			Low.	15.50	2.38	19.13	6.83
7th	30	105	Upp.	3.40	6.20	9.84	2.90
			Low.	10.66	14.23	20.70	7.38
8th	26	116.5	Upp.	7.08	9.92	19.60	5.40
			Low.	8.69	14.23	14.40	-1.00
Totals and averages	89	102	Upp.	4.15	4.69	12.47	4.69
			Low.	13.28	22.34	17.56	9.30

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The upper group is ahead 3 times out of 16. In the average gains the lower group is always ahead. Table XII gives a summary which includes the average gains made in each ability between the first and sixth tests, between the fourth and sixth, and between the sixth and seventh tests, and the medians in each test used as a basis for measuring gains.

TABLE XII
SUMMARY

Ability	No.	1 Med.	1-6	4 Med.	4-6	6 Med.	6-7
Addition	88	40.6	Upp. 18.58	48.5	10.10	57.8	-.31
			Low. 20.8.2		12.48		2.46
Subtraction	88	29.3	Upp. 19.83	39.9	9.69	51.9	.40
			Low. 23.26		13.85		2.80
Multiplication	89	26.3	Upp. 22.96	39.8	10.92	54.6	-3.00
			Low. 28.20		12.04		-2.86
Division	89	27.6	Upp. 23.87	42.2	10.67	55.5	-6.84
			Low. 27.33		16.19		-.13
Copying Figures	89		Upp.	102	4.69	111.1	4.69
			Low.		12.34		9.30

The negative gains between the sixth and seventh tests represent losses which are greatest in the upper group.

It seems that in this study, where the tests were given with the greatest of care, and where the test sheets were carefully scored and the results carefully tabulated, the greatest improvement was made by the group that started with the lowest ability. The same result is shown whether we base the gains upon the first test of the year, which was perhaps new to many if not all of the pupils, or whether we use a later test as a basis. The rate of forgetting, or loss in ability, is greatest in the upper group as is shown by computing the changes that take place between the sixth and seventh tests.

It should be kept in mind that the drill in this study was not as intense as that reported in Study I. The results are not so consistent as those in the former study. The contest feature did not result here in urging those near the top of the

group to do still better and thus outdo their fellow classmates. The study covers a whole year of school class work, and any enthusiasm which might result from a short period of training does not affect the final results in any way.

STUDY III

Tests in Fundamentals and in Reasoning

Thirty-four pupils of the 6th, 7th and 8th grades of the Granite Falls, Minnesota, Public Schools were given the Stone Tests in fundamentals and in reasoning. These pupils were then drilled for ten minutes daily for a period of eight weeks. A full report of this study is given in the *Journal of Educational Psychology* for March, 1913. At the end of this drill period, a test similar to the first was given.

For the purposes of study, the pupils were divided as before at the median point into two groups. They were further divided into three groups and a tabulation of gains made for each group. Table XIII gives the medians and gains made by each group, taking all the grades as a whole.

TABLE XIII

		Medians	Gains	Gain %
Reasoning	Upper $\frac{1}{3}$	9.03	1.31	14.5
	Lower $\frac{1}{3}$	3.21	1.56	44.4
Fundamentals	Upper $\frac{1}{3}$	30.35	6.53	21.5
	Lower $\frac{1}{3}$	19.41	7.65	39.4
Reasoning	Upper $\frac{1}{3}$	10.63	.84	7.9
	Middle $\frac{1}{3}$	5.48	1.78	32.5
	Lower $\frac{1}{3}$	2.31	1.82	78.8
Fundamentals	Upper $\frac{1}{3}$	31.82	5.27	16.8
	Middle $\frac{1}{3}$	24.50	7.17	29.2
	Lower $\frac{1}{3}$	17.55	9.36	53.3

In this study, those making the lowest scores made the best gains. This difference is not strongly marked excepting between the upper and the lower thirds in fundamentals. At no time does the upper group make a better gain than that made by a lower group.

The drill given in this study was given by the teacher training students in the high school. They were not artists in drill work; therefore, the drill is less intense than that given in the two former studies. The writer personally conducted the preliminary tests and the final tests. He supervised those giving the training so that a check was possible at all times during

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the drill period. The contest feature did not enter as between different groups, although it did enter when we consider the whole group, as all these students were striving to do better work than another group not included in this study.

STUDY IV

Tests in College Algebra

At the beginning of the semester in 1915 the test in algebra shown in the appendix, page 352, was given in four colleges to students taking college algebra. The colleges represented are Central, Penn, Drake and Carleton, which vary in size from small colleges to large ones. 158 students took the first test. The scoring was so arranged that a score of 69 might be made upon a perfect paper. The scores obtained ranged from 3 to $38\frac{1}{2}$.

At the end of the semester the test shown in the appendix on page 354, was given to as many of these same students as possible. 116 students took both tests. Of this group, the median score in the first test was 22. Of the 42 who took the first test who did not take the latter test, 11 had initial scores above the median, and 31 had scores below the median.

The score that might be obtained in the second test is 80. The scores obtained range from 0 to 59. Each school was scored separately as the tests were given under so many different conditions. The results obtained were divided at the median point for each school, and two groups obtained that contained half of the students from each school. Three groups were also made as in former tests, and the gains of each group were obtained.

The work done between the sixteen or eighteen weeks that intervened between the drills was that of the ordinary class room of the various colleges. The drill then in this case, is the ordinary work of the special teacher in charge of these classes.

Table XIV shows the medians, and gains for each of the groups mentioned.

TABLE XIV

	Median	Av. Gain	Gain %
Upper $\frac{1}{2}$	28.0	.310	1.1
Lower $\frac{1}{2}$	17.6	3.293	18.7
Upper $\frac{1}{3}$	30.0	.821	2.7
Middle $\frac{1}{3}$	22.2	1.085	4.9
Lower $\frac{1}{3}$	15.5	3.846	24.8

It will be observed again, that the pupil making the lower initial score has made the better gain, while the one with the high initial ability has made a smaller gain. The difference is more marked in this test, although the gains are very small as compared with the initial score.

The initial ability in college algebra might be difficult to measure, and it is observed that Test No. 1 tests only the fundamental processes in high school algebra. Test No. 2 also contained some topics not treated by all schools. The scores, however, were so divided that the pupil might put in the entire time of the test upon topics that he had studied. The conduct of this study was not entirely satisfactory to the writer, but is the best that was possible to obtain.

It is believed by the writer that the drill is less intense in this study than in any of the former studies. The contest feature did not enter in any way, as those giving the examinations were not aware of just what use would be made of the results. It was promised that the work of no particular college would be mentioned. The writer personally conducted one of the classes, giving both tests, and his class did not know for what use the tests were intended.

In this study, too, the differences in the gains of the groups were more marked than in the former studies. It seems in these studies, that as the intensity of the drill decreases, the gains of those with the better initial ability, become less prominent, while the gains of those with a lower initial ability become comparatively greater.

It may appear that the material in this study is different from that in the other studies reported as the students were of college grade rather than those of the public schools. It was pointed out on page 3 that the writer sought to approach the question from several angles, and this study is one more observation upon the general question of the relation of initial ability to the extent of improvement. It adds a bit of testimony, and the answer it gives to the general problem is not different from the other answers except as to extent of gains made.

STUDY V

Tests in the Four Fundamentals

1,001 pupils of the Boston public schools were given the Courtis B Tests in January, and the same test again in April. The pupils tested were a random selection from about 21,000 pupils. The manner of giving the tests, scoring the results, and tabulating the gains made was that given under the general instructions for giving this particular test. The work done during the interval between the tests was the ordinary

arithmetic work of the school system of that city. The drill, then, was only the ordinary class work of the regular teacher.

The grades tested in this way are the 4th, 5th, 6th, 7th and 8th. There were approximately 200 pupils in each grade. The scores tabulated are for addition, subtraction, multiplication and division, in each grade with the exception of division in grades 5 and 6. On account of errors in the length of time and in scoring these grades, the results for division are omitted. The exact number of pupils scored in each grade is as follows: 8th—198, 7th—202, 6th—202, 5th—199, 4th—200, making a total of 1,001.

From the results obtained in the initial test, the number of problems right is used as a basis for study. Table XV shows the medians for each fundamental for each grade.

TABLE XV

Grades.	IV.	V.	VI.	VII.	VIII.
Add.	2.8	3.6	4.7	5.6	7.3
Sub.	2.7	4.5	6.5	7.3	8.7
Mul.	1.6	3.3	4.5	5.1	6.6
Div.	.6	2.1	3.8	5.1	7.1

Each grade was then divided into two groups in each fundamental. As there were no fractional scores, the division point for the two group division was made at the nearest point to the median where there was a change in score. For the three group divisions, the divisions were made as near the tertiles as possible, where there was a change in the score. Table XVI shows the number of pupils in each group, in each grade, in each fundamental.

TABLE XVI

	U $\frac{1}{3}$	L $\frac{1}{3}$	U	L	M $\frac{1}{3}$	
Add.	91	107	72	63	63	8th grade.
Sub.	101	97	76	56	66	
Mul.	87	112	64	78	57	
Div.	97	90	60	67	70	
Add.	94	107	68	72	61	7th grade.
Sub.	94	108	64	80	58	
Mul.	87	115	57	68	77	
Div.	99	103	73	51	78	
Add.	102	100	54	77	71	6th grade.
Sub.	103	97	49	80	71	
Mul.	87	114	56	63	82	
Add.	80	119	62	76	61	
Sub.	93	104	63	75	59	5th grade.
Mul.	94	105	55	65	79	
Add.	87	112	60	59	80	
Sub.	95	106	68	56	77	
Mul.	120	79	71	49	79	4th grade.
Div.	33	168	33	84	84	

It will be observed that these figures only approximate the halves and the thirds of the total number of students. The average, however, is about right. It was thought better to make the divisions in this way than to make them exactly on the medians and tertiles, as such a division was not well marked where the scores were small and all integers.

Table XVII shows the average gains made by each pupil, in each grade, in each fundamental, by groups of two's and by groups of three's.

TABLE XVII

	U $\frac{1}{2}$	L $\frac{1}{2}$	U $\frac{1}{3}$	M $\frac{1}{3}$	L $\frac{1}{3}$		Average
Add.	1.901	2.645	1.778	2.270	2.937	8th Grade	
Sub.	1.812	3.917	1.728	2.786	4.182		
Mul.	.943	3.080	.688	2.436	3.386		
Div.	.871	2.933	.833	1.094	3.300		
Av.	1.382	3.144	1.269	2.147	3.451		2.289
Add.	1.745	2.477	1.750	1.917	2.819	7th grade	
Sub.	1.457	3.029	1.547	1.950	3.606		
Mul.	1.058	2.696	.929	1.485	3.221		
Div.	.636	3.339	.795	2.333	2.962		
Av.	1.224	2.885	1.255	1.921	3.152		2.109
Add.	2.000	2.660	1.870	2.338	2.662	6th grade	
Sub.	.961	3.041	.266	1.775	3.366		
Mul.	.689	2.789	.304	1.683	3.110		
Av.	1.217	2.830	.780	1.932	3.046		1.919
Add.	1.088	2.328	.855	1.934	2.688	5th grade	
Sub.	.452	2.769	.000	1.893	3.186		
Mul.	1.159	2.657	.745	1.815	2.899		
Av.	.899	2.551	.533	1.881	2.918		1.777
Add.	.678	2.259	.500	1.365	2.525	4th grade	
Sub.	1.232	2.123	1.118	1.929	2.052		
Mul.	1.267	1.834	.944	1.735	1.843		
Div.	.879	1.786	.879	1.786	1.786		
Av.	1.014	2.003	.860	1.702	2.052		1.538
GAINS IN ADDITION							
Av.	1.482	2.474	1.351	1.970	2.884		2.068
GAINS IN SUBTRACTION							
Av.	1.183	2.976	.932	2.067	3.273		2.068
GAINS IN MULTIPLICATION							
Av.	1.023	2.613	.722	1.831	2.892		1.815
GAINS IN DIVISION							
Av.	.795	2.686	.852	1.738	2.683		1.758
Average gain in all fundamentals: all grades:							1.933

There were no negative gains, and only one 0 gain occurred, that is in the upper tertile of the fifth grade subtraction.

In every case in this study, the pupils making the lowest initial scores made the highest gains. This is true when the pupils are grouped into two divisions, and when grouped into three divisions. The difference in gains by these groups is greater than that of the other studies, and is rather high in proportion to the median abilities of the various groups.

It should be stated here that these pupils were accustomed to standard tests, and had taken this particular test for two or three years before.

It is noteworthy that the best gains were made by the eighth grade, and that there is a gradual decrease in the gains made in each successive lower grade. The average gain for all grades, for all fundamentals, is about 2 problems. The average median in the first test is about 4.7 problems. This may mean that the best time for drill is in the upper grades.

There may be some doubt as to whether the pupils in this study received a less amount of drill than did those in the college algebra. At any rate the results are similar, a large gain for the lower group and a smaller gain for the upper group.

Summary and Conclusions

We now have before us the results of five studies in which a comparison can be made of the amount of gain, based upon the relation of this gain to the initial ability of the pupil. The studies are arranged in the order of the intensity of the drill given to the students concerned. In the first study there is a great amount of intense drill. In the second study this is less intense. In the third study there is still less of special drill. In the fourth and in the fifth studies, the drill is that of the daily work of the ordinary classroom teacher.

In the first study, the pupils making the highest initial scores made the best gains. In the second study the upper group made the best gain in only 47 out of 176 comparisons, while the lower group made the better showing 129 times. In the third study the upper group fails to make a better gain at any time than does the lower group. In the fourth and in the fifth study the lower group makes a much better gain in every phase of the work. In the last study the group with the lowest initial ability made more than two times as much gain as did the upper group, and this in the face of a much lower initial score. When these results are reduced to rates rather than to differences, the showing for the lower group is accentuated.*

* See Tables XIII, and XIV.

It is noteworthy that each particular study gives about the same general results throughout the whole investigation. That is, each study is consistent all the way through, as far as results are concerned. In no study do we find one group making a better gain in one place and poorer in another.

The writer is able to draw only tentative conclusions at this time. It seems that the amount of training, and the intensity of the drill, have an effect upon the extent of the improvement in such a way that the well-trained individual will respond best if he has a high initial ability. This means that we may build best upon a safe and sure foundation.

At no point in any of these studies was the writer able to foretell what level of attainment would be reached by any definite amount of drill. What gains a given individual may make under a stated amount of drill, does not give in any way a basis for estimating with any degree of certainty what gain he will make from any given amount, or from the same amount of additional training.

It is not apparent that those represented by the lower group, in any of these studies, made low initial scores because of previous neglect. They evidently had the same environment, the same opportunities, the same attention, the same teaching, as did the other pupils in the upper group. Nor is it evident that those in the upper group in any study had about reached the limit of their capacity in these several abilities. The lower group had more room to grow, although in no instance did it reach the level of the upper group.

The intensity of the training, mentioned above, is difficult to measure. The best indication of intense training is found in the interest of the pupils, their eagerness for the drill. There is no adequate measure that will tell how much interest a pupil has. In the first study, however, there was intense interest upon the part of those who were able to make a score near the top. There was real competition among those able to get on the honor roll each day. This incentive made the better students strive to outdo each other, while those in the lower group were not spurred by any incentive except to better his record of the day before. Without this reason for putting forth effort, lacking such a powerful stimulation, the writer's observation is that the better pupils perform rather mechanically. Their ability enables them to pass along without reproof, and they put forth an effort sufficient for an output near the minimum requirement.

Had this competition been introduced among all groups the result might have been different. Had the pupils been grouped into three or five groups, according to ability, and then the

competition introduced within each group independently of the others, there would have been the same incentive for the pupil with the low initial ability that existed for those near the top. Had the contest feature been eliminated entirely, the writer believes the first study would not have been much different in result than the later studies. The element which made the drill intensive would have been lacking.

While acquisition of knowledge has much to do with enabling the pupil to perform well, no attempt was made to test the pupil's information in these fundamentals, nor in any other facts of arithmetic, nor of other subject matter. The measure

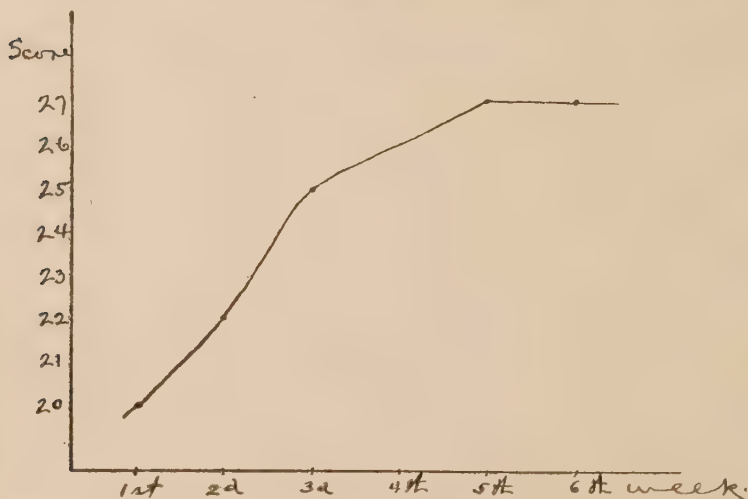


FIG. I.—Curve showing progress made during six weeks of practice in 5th grade multiplication

is simply a measure of the *output, the ability of the pupil to perform, to turn out work*. The number of correct solutions in the given time gave him a score which was used as a basis for the comparisons made. The comparisons are those of groups and not of individuals. The improvement noted is compared in amounts and not in rates.

A study of the learning curves, in the ability to perform, as found by investigators in the field of educational psychology, reveals a law of diminishing returns. These curves are convex. They show that progress is more rapid near the beginning of a period of training than at a later time. There is evidently a limit to the improvement that an individual may make under any system of training. A point is sure to be

reached in the training of every individual, when the returns for a given amount of training are not as great proportionately as they were earlier in the course. This is noticeable in the works of Book, Bryan and Harter, Swift, Lashley, and others. Whether the law applies to the acquisition of knowledge, as well as to the ability to perform, has not been determined.

The writer found abundant evidence of a law of diminishing returns in this investigation. The curve in Fig. I is typi-

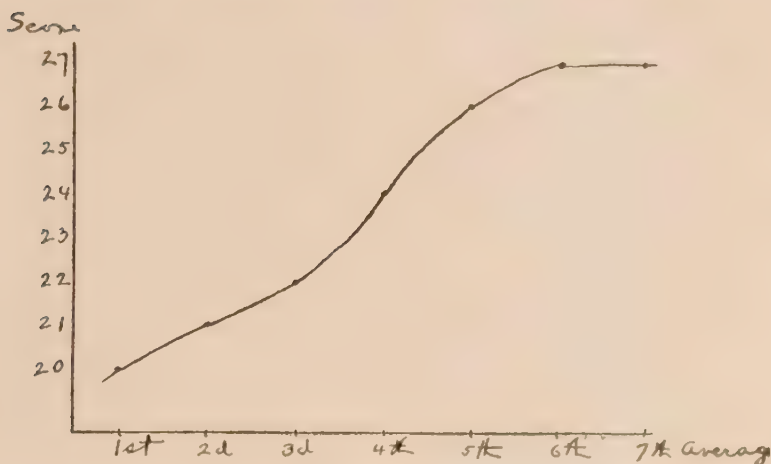


FIG. II.—Curve of Fig. I smoothed by use of the moving average

cal of the curves of progress, where it was possible to measure the improvement from time to time as the drill was carried on. The average scores for the 5th grade in multiplication for the beginning of each week as found in Study I are 20, 22, 25, 26, 27, 27, for the six weeks of drill. The moving averages for this series, including three numbers of the series, are 20, 21, 22, 24, 26, 27, 27. Fig. II shows this series graphically.

The convex curves show that the various groups had about reached their level of attainment incident to the kind of drill they were receiving. It is agreed that this level is not high. The Curtis standard for the 5th grade multiplication is 30. This is the 70 percentile of the group from which this standard was made. The scores given here represent the approximate 50 percentile, for an average of five minutes of work. The writer discovered that pupils do more in the first minute of a

practice of this kind than they do in any later minute. A brief report of his investigations upon rates of work is published in the *Journal of Educational Psychology* for May, 1916. The first minute averages for the 5th grade multiplication in this study are 25, 25, 32, 35, 31, 34.

It seems to the writer that answers may be made to his questions as stated in the introduction of this study.

1. Initial ability is a factor in the extent of improvement an individual may make during a practice period. It seems that the farther an individual is away from his point of diminishing returns the more improvement he may make under a prescribed amount of drill and training. We will admit that improvement is a sign of ability. But an individual may show a high initial ability and still reach his limit of improvement very soon. A capable individual may have a low initial ability and have plenty of capacity for improvement. These various levels of attainment differ with the several systems of drill under which he may be placed.

2. It is not possible to approximate the level of attainment a group should reach under a prescribed amount of training. The progress it makes depends upon several things, among which are the several capacities of the group, the interest shown in the work, the kind of other interests of the group, the several abilities with respect to the several possibilities of attainment. Many of these factors do not admit readily of measurement.

3. Certain limits do appear in the amount of improvement that may be made under class training as is shown by the nature of the learning curves when applied to the ability to show results under a time limit. It is not the intention of the writer to discover what limits appear in the matter of acquiring knowledge, but in the ability to perform in the several abilities mentioned in this study, as well as in acts of skill investigated by others, limits appear. These limits are inevitable in performance tests.

Educational Value of the Study

From the viewpoint of the school supervisor, these and similar studies aid in answering certain questions in an inductive way. The only way to find the rate of work for a given group of pupils is to have them do specific work under a time limit, and measure the output. If it is desired to know how much work of a given type a certain grade should do in a given time, normal and well taught students should be set to work under prescribed conditions and a measure taken of what they actually do. The effect of the length of a practice period can be

obtained only by varying the practice period and measuring the results of each variation. The proper distribution of the time of practice can be found by trying different lengths of practice periods, distributed in different ways, and measuring and comparing results. Work curves are valuable in showing rates of speed at different times during the work period. The effect of vacations upon the output of a group can be obtained experimentally. Measures of fatigue, when it appears, how it is produced, and how long it lasts, can be discovered only by trying pupils at work for long periods of time, and note when a decrease in output occurs. True, decrease of output has other causes than fatigue, and these other causes can be determined also. Our best evidence of fatigue is in a decrease of output, and this decrease can be determined experimentally. This method of determining causes, and results, is better than to accept mere opinion, and then strive to interpret educational movements, and to shape school policies by these opinions. The light of investigation often reveals misdirection of energy because opinions have outweighed facts where the facts themselves have never been searched out.

From the viewpoint of the pupil these experiments are valuable as agents of motivation. The pupil is pleased to have the educational yardstick applied in a definite way. He has no doubt now in regard to his ability as compared to that of his classmates. He is made to feel his personal responsibility in the matter, and seeks to improve himself with renewed interest. He assures himself that his teacher is not guessing at his ability, but that he is actually measuring it. A better understanding results between pupil and teacher, and between teacher and supervisor, which ought to bring better educational returns.

APPENDIX

TESTS IN ALGEBRA

F. M. PHILLIPS
Central College

Name

School

Read these directions.

1. You will be given fifteen minutes to work out some exercises in algebra. Do not turn the sheet, nor examine the exercises until the signal is given for starting.

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2. When the signal is given for starting, open to Exercise I. and work at that until told to start II. When the signal is given start at II. immediately, and work at that until told to start III., etc., until the final signal is given to stop working.

3. If you complete an exercise before the signal is given to start the next one, start to work upon it without waiting for the signal.

4. Put down all the work needed in getting solutions, using the blank spaces on the sheet.

5. In the last exercise use algebraic solutions, do not employ arithmetical solutions, nor guesses.

I. Multiply as rapidly and as accurately as possible during the time given:—

$$5x^3 + 7x^2 - 3x + 4$$

$$5a^3b + 2a^2b^2 - 13ab^3$$

$$3x^2 - 4x + 6$$

$$8a^2b - 7ab^2$$

II. Divide as rapidly and as accurately as possible during the time given:—

$$\underline{3x^2 - 2x + 7) 15x^4 - x^3 + 17x^2 + 29x - 28} (\underline{\hspace{2cm}}$$

$$\underline{\hspace{2cm}} \underline{x^2 + 4x + 5) x^5 - 38x + 110} (\underline{\hspace{2cm}}$$

III. Factor as many as possible during the time given:—

$$x^2 - 8x + 15 =$$

$$x^2 - 100 =$$

$$9a^2 + 12a + 4 =$$

$$5x^2 - 8x + 3 =$$

$$a^3 - a =$$

$$x^3 - 64 =$$

$$x^4 - 7x^2 + 1 =$$

$$x^3 - 15x - 4 =$$

IV. Find the value of x for as many as you can:—

$$1. \quad 6x + 4 = 2x + 24$$

$$2. \quad 8x - 7 = 33 - 2x$$

$$3. \quad 3(3x - 2) - 6(4 - x) = 24x - 4(7x - 2)$$

$$4. \quad \frac{x + 3}{5} - \frac{2x - 4}{2} = 4 - x$$

V. Find the value of x for as many as you can:—

$$1. \quad x^2 + 8x = 65$$

$$2. \quad x^2 - 5x = 24$$

$$3. \quad 6x^2 - 5x = 6$$

$$4. \quad 7x^2 + 5x = 150$$

VI. Solve as many as you can. Put down all the work, using the blank spaces on both outside pages:—

1. Three times a certain number added to eight times the number equals 88. Find the number.

2. The sum of two numbers is 32 and their difference is 6. Find the numbers.

3. The sum of two numbers is 63, and five times the smaller equals four times the larger. Find the numbers.

4. A can do a piece of work in 8 days and B can do it in 6 days. How long will it take both working together to do it?

5. How far from a given point may A ride at the rate of 8 miles per hour, in order to walk back at the rate of 3 miles per hour, and be away $8\frac{1}{4}$ hours.

6. The distance around a field is 140 rods and the area is 1200 square rods. Find its length and its breadth.

TESTS IN HIGHER ALGEBRA

F. M. PHILLIPS
Central College

Name

School

Read these directions.

1. You will be given fifteen minutes to work out some exercises in algebra. Do not turn the sheet, nor examine the exercises until the signal is given for starting.

2. When the signal for starting is given, start the work, giving about $\frac{1}{3}$ of your time to each page of exercises. The examiner will give five minute signals.

3. Put down all the necessary work for each exercise, using the blank spaces on this sheet.

I

Factor into prime factors:—

$$x^4 + 4 =$$

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$$12x^2 + 11x - 70 =$$

$$x^{12} - y^{12} =$$

$$x^3 - 10x^2 + 33x - 36 =$$

Solve for x and y:—

A

$$x^3 - y^3 = 98$$

$$x - y = 2$$

B

$$x^2 + 3xy = 55$$

$$xy - 2y^2 = 2$$

II

1. What is the chance of throwing three heads in one throw with three coins.

2. How many positive roots has this equation if all are real roots?

$$x^5 \div 3x^4 - 12x^3 - 66x^2 \div 64x \div 72 = 0$$

3. Given the following logarithms, $\log 2 = .3010$, $\log 3 = .4771$, and $\log 5 = .6990$, find the following:—

$$\log 4 =$$

$$\log 9 =$$

$$\log 1.414 + =$$

$$\log 6 =$$

$$\log_3^5 =$$

$$\log 81 =$$

$$\log \sqrt{5} =$$

$$\log 15 =$$

$$\log 45^2 =$$

Resolve this fraction into partial fractions:—

$$\frac{7x - 12x - 67}{(x-3)(x+1)(x-5)} =$$

III

Solve this determinant:—

$$\begin{vmatrix} 4 & 2 & 5 & 1 \\ 3 & 3 & 2 & 5 \\ 8 & 1 & 10 & 2 \\ 5 & 2 & 3 & 5 \end{vmatrix} =$$

Find as many values for x as you have time for:—

$$x^8 - 22x + 36 =$$

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THE WAR AND THE PSYCHOLOGY OF THE CHILD

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For twenty-five years, the Department of Child Study in the Massachusetts State Normal School at Worcester has been making systematic observations of children of all ages and all walks of life. Thousands of returns have been published from time to time either in book form or in the pages of educational periodicals—notably the *Pedagogical Seminary*. In fact this school may be said to be the cradle of child study in this country, inasmuch as it was her students who, laboring under the inspiring direction of the first Principal, the late E. Harlow Russell, and in closest sympathy with the founder of child study, President G. Stanley Hall of the neighboring Clark University, were the first group of American observers in a large way to study both intensively and extensively the mind and the soul of the child.

For nearly three decades it has been the practice in this School through its Department of Child Study, to supplement the training of young teachers with a liberal amount of experience in studying child nature directly and objectively. The city of Worcester has a population rapidly approaching the 200,000 mark, and the great diversity and extremely cosmopolitan type of her population not only afford ample opportunities for the free observation of children, but make any attempt at studying them particularly interesting. The motto of the Department has remained unchanged since the early nineties; it is this: *The master workman must know his material*. The master workman is the master teacher; the material is the child. Armed with this philosophy, the students each year enter quite voluntarily upon their 'observation campaigns,' and never without obtaining both interesting and surprising results. At the end of a few days most of them have noted new things in the children at their own homes which they had never suspected existed. By the end of a week they find themselves overwhelmed with interesting and wonderful discoveries; and by the time the course has ended they have come, in most cases, not only to feel a keener interest in children but, and equally important, to possess trained insight and higher powers of observation—traits that will stand them in good stead when they actually enter upon the profession.

In most cases the observations made are quite uncontrolled; that is to say, ordinarily the method pursued is entirely free. The students endeavor so far as possible to note merely the spontaneous activities and reactions of children. They try never to let their 'material' even suspect that they are being watched or listened to, the idea being to rule out all suggestion and all conditioned response. The child on the car, or in the street, or on the playground, or in the house, or over the book, or in the gang, behaving in a perfectly free and unconstrained manner, is the ideal for observation kept always in mind. The child wide awake and intensely active; the child at work or the child at play; the child alone and the child in the group; the child serene and the child under stress of the emotions; the child working and the child at sleepy time—each condition is equally promising to the interested and inquiring student.

Child study blanks for permanent records of all observations made are supplied and carefully checked up. Those which are mediocre, or those which, while faithfully mirroring a child's reactions, do not really add to the science of child study, are destroyed. As the year passes, however, it is found that this type of observation becomes less and less common. Those returns which, on the other hand, are of special significance are carefully tabulated and filed for future use. It is an unusual week when from two hundred to three hundred interesting observations are not reported by the students.

In going over the several thousands of observations recorded in this Department during the past fall and winter months, I have been particularly struck with the great number of returns which indicate the interest children are manifesting in the great war.¹ Under normal conditions, the percentage of strictly military observations is very low; but during the past year some 10% of all our observations fall within this general classification.

The reason for this keen interest which children are taking in things military is not far to seek. They are hearing war talk, seeing war scenes, saving in the interests of war, living in an atmosphere that is becoming increasingly war-like; why should they not feel war and play war? Feelings do not lie very deep in a child, and what he feels keenly he dramatizes. And yet there are superintendents and teachers still who think the war ought not to be taught. After all, it makes little difference whether we teach it or not for we may be sure that the child, living continually in a war environment, is coming more

¹ This paper was written shortly before the close of the war.

and more through imitation and emulation to think, act and play in terms of war. In Germany, we are told, the school children are not only being taught about the struggle, but they are at the same time being imbued with a fiery patriotism such as was never before known even in Germany, where for generations children have been drilled almost from the cradle to glorify the fatherland and the kaiser.

One rather significant thing since the war started has been the influence which it has exerted over the plays and games of children. War games and war toys have multiplied more rapidly than any other variety of amusement. Playing soldier, digging trenches—in either snow or earth according to season; marching games; martial songs, airs and ditties; military drill—more or less according to manual; military dress and postures;—these are but a few of the many tokens of the way the child is weaving the war into the fabric of his play life.

The purpose of this discussion is not, however, to generalize upon juvenile reactions to the war; it is rather to enumerate a great many aspects of the war as seen through childish eyes. The data represent selected observations taken from several hundred returns made by students from their direct study of children. For greater uniformity I have grouped these observations under 5 headings, although naturally no very close lines of demarcation can be drawn between the different groups. As they stand, the observations represent a considerable number of free, native responses made by children of all ages to the general situation: war.

1. *Playing at war.* This group includes by far the greatest number of observations. There seems to be no limit to the facility with which a child can relate the most commonplace experience in some way with the notion of war.

Two boys standing opposite each other at a distance of some twenty-five feet playing foot-ball. Between them are drawn two lines. One boy kicks the foot-ball toward the other, and if it falls beyond the line nearest to the other boy it is promptly acclaimed "an American bomb." If it falls short it is dubbed "only a German bomb." That boy becomes automatically the winner who succeeds in getting the greatest number of "American bombs" to his credit.

Two boys, waxing enthusiastic over the war, one says: "I'll be a United States Soldier and you be the German!" (In all the returns it is an unwavering rule that the 'German' soldier is never the leader; apparently it is an unpopular rôle). The other boy replies: "No sir! I'll not be the German, for you know a 'United Stateser' can kill a German!"

The day after the kilties paraded in the city, the atten-

tion of every one was called to a large group of boys who were dressed in all sorts of costumes imitative of the Scotch. Their stockings were pulled down over their shoes; they had rag bags for skirts and tin basins decorated with paper streamers for hats. They were marching in single file, some having flags, others sticks to represent guns and swords. They were very noisy and created considerable attention on the part of by-standers. There were about twenty boys in the line, and their ages ranged from eight to fifteen years.

A was an interested observer of the following incident which took place after school on Friday. A group of boys took possession of a discarded barn which lay in the rear of A's yard. This they called their 'munition factory,' for in it they had gathered together all sorts of ammunition and war paraphernalia. This included air-rifles, wooden guns, canes, tin pans and two boards nailed together in such a way as to give a fairly intelligent observer the idea of a cannon. Here they got their equipment and immediately resolved themselves into two groups, one jumping over the fence and taking up its position on the other side. At a given signal a boisterous shouting was heard along the fence and the battle was begun. At a second signal a few minutes later the fighting ceased as abruptly as it had started; the combatants reformed into one group and marched off down the street singing *The Star Spangled Banner*. One played a drum by beating two sticks furiously upon a tin pan; another played the flute—an old harmonica. At the command "Attention!" every one stopped and then various gun movements were gone through. With the command "March!" the band continued on its way until it came back to the old barn. Chancing again to pass through this vicinity yesterday, A beheld one boy ostracised from his fellows and confined in the barn-yard. Upon inquiry, A learned that he was a 'German spy' who had been detected in the act of peeping around the corner.

A new building being in process of erection and the cellar only just completed, a group of children armed with rifles and paper hats made their trench headquarters within. One boy only stood in the open giving commands, and informing his men of the approach and strength of an imaginary enemy. A few of the boys fell back in the trenches in the course of the action, severely wounded. Two others, the only possessors of Red Cross buttons, advanced through the dark trenches and bore them one by one off the field.

There are many instances of both girls and boys tying strings about their waists and fastening to them all sorts of wooden swords, guns, pistols and ammunition pockets. An

old garden cultivator tipped bottom-up becomes a mighty war ship, with the teeth serving admirably as big guns. Discarded tin soldiers are resurrected under the inspiration of the war interest and are incorporated into allied and German fighters. The chief attraction of the toy counter becomes the soldier's belt, the horn, the pistol and the sword. 'Wounded' soldiers are succored and revived by potions poured between their smiling lips, and their wounds are stanchd by handkerchiefs and neckties bound promiscuously about their bleeding members. The tent in the back yard takes on a new interest as a boy makes it his military headquarters and stations his men about it as a body guard. Tunneling in the snow is no longer done without a strict military purpose; snow forts are located in most strategic sectors of tunnels and trenches. A stick with a bit of colored paper pinned to it answers very well the purpose of a flag for those who have no more imposing banner. The military salute is accorded to whomsoever chances to pass; or it is given to a flag either waving from a pole or stuck between the lattices of a blind. A real soldier at a camp becomes a hero, and after a visit from such a grand personage one little boy became dissatisfied with his own name and begged his mother to call him by the soldier's name. Opposing 'scrub teams' and basket-ball teams are American and German in personnel. Leaders in war games adopt the names of brilliant contemporary statesmen or soldiers. Thus, President Wilson and the Kaiser often glare at each other from behind fortified places. General Joffre and General Pershing engage Hindenburg and von Kluck in mortal combat, and, if the former are not sufficiently valiant to vanquish them utterly there are always Uncle Sam and King George to back them up.

The greatest ingenuity is shown in our returns in finding fitting insignia and decorations for the troopers. Colored tinsel cord, bright papers, brass buttons and firemen's caps vie with parts of discarded Grand Army uniforms or buttons surreptitiously and stealthily removed from them, crosses cut from red paper, boy scout suits, flags and feathers. Black shoe buttons are bullets. Girls wear white shawls, white aprons, white neckerchiefs, and most often assume the rôle of Red Cross nurses. For drums and band instruments a great variety of implements and utensils are pressed into service. Tomato cans, dish pans, wash basins, boiler covers, garbage pails, inverted peach baskets suspended from the neck by strings are all equally good. Two tin covers clanged together make inimitable tambourines. Helmets are made readily by slitting down an old stocking or a toque and

pulling it over the head. A fairly satisfactory cap is constructed from paper; a better one from pasteboard. A gun may be either a pistol, an air-rifle, a bow and arrow, or, and in most cases, merely a stick. Sharpened sticks become bayonets. If an attack is made so unexpectedly that there is not time to entrench, a stone wall or even a hedge affords a desirable protection against the artillery of the enemy. A harmless pear tree in the back yard is transformed at sight in the mind of a six-year old into a formidable German, and a cautious course is steered about it for a few moments, after which the soldier falls to beating it with his stick. The 'Harvard Relief Corps' marches down the street to the tune of 'America,' each member of the unit holding to the shoulders of his fellow in front. Passers-by are accosted with the sharp challenge: "Are you a German?" Upon denial of such nationality, the pedestrian is allowed to proceed with the command: "Very good! Pass on!" The brow of a hill is made the fighting ground between two hostile armies which have crept up either side. Even after retiring to bed at night the glamor of war remains bright and boys well entrenched behind their blankets lull themselves to sleep by shooting Germans. Any boy who is so fortunate as to possess a Boy Scout suit, a fireman's cap or other insignia of distinction is proclaimed captain, or general, regardless of temperamental qualifications. A 5-year old becomes so animated upon hearing the war discussed by his father and mother that he dances about in a whirlwind, doubles up his fists, strikes his playmates and keeps shouting ecstatically: "Playing wars! Playing wars!" A stingy, unsocial or otherwise *persona non grata* playmate is dubbed a slacker, and so heralded among his fellows. Rein-statement in grace is granted readily as soon as the offending party manifests due intent to conform.

2. *Playing imaginaries.* A considerable number of our returns may be rather generally classified under the caption. It appears that boys and girls try to visualize real war scenes as they must appear at the front, and take endless delight in manipulating this imagery. In general, however, it is the older children, i. e., those between seven and ten, who find such imaginings interesting. With the younger children, it is quite enough to play at war rather boisterously and without making any particular attempt to reproduce real war conditions either in their games or in their imaginations. It is only when they get a little older that there comes the desire for greater accuracy in detail and reality in imagery as they endeavor to comprehend the war and to dramatize it in their sports. A toy train is laden with sticks and papers and run express in

and out among the tables and the chairs until there is a crash and a wreck. The freight carried represents food and guns which are being rushed to France. The wreck is caused by an obstacle placed by the Germans in the pathway of the on-coming train. Fighting in the trenches is represented as not being in progress over Sunday, in order that the soldiers may "look at the funny picture papers!" One boy of six grew so apprehensive upon learning something about the Germans blowing up houses and buildings with bombs that he was reluctant to go to school, fearing that the schoolhouse might be blown up. Asking God to bring back safely his father, who had recently enlisted, an 8-year old added: "And I hope some day I will grow up so I can help Papa lick the Germans!" The arrival of a new family in a street is the stimulus which sets off the boys of the neighborhood to parade back and forth in front of the house, crying: "Germans! Germans! We have got Germans moving into our street!" The new boy is at once dubbed a German, and refused admission to the gang. A 7-year localizes the war zone as "down Boston, where the Germans are shooting the Boston people." One boy has experienced a great interest in cartoons of the Kaiser, and has actually cut out over four hundred of them from various magazines. Children are promised war stories as rewards for being good at school, all day, and look forward to them with keen anticipation. Liberty bonds are constructed and shouted on the street by youthful salesmen for 5 cents. "Shut up! Don't you know you oughtn't to speak when the 'Merican flag is around!" is the greeting which a 7-year old returns a thoughtless girl who had merely said: "Hello!" The proud possessor of a "shoulder suit" makes very active preparation for departure to France within a week, although he is only four. Another boy, somewhat older, exclaims to his fellows: "I hope the war keeps on 'till all the soldiers are killed; they'll have to take all us boys then! I'd kill every German and then come home!" An 8-year old girl figures out the procedure in the sinking of a vessel by a German submarine thus: "The submarines are under water, and when a ship goes by the people in the submarine throw up a long rope. This catches on to the bottom of the ship, and the people in the submarine pull down the rope and the boat sinks!" Another girl of the same age describes the German method of blowing up ships thus: "They take a little powder on their submarine and when any ship comes along, the submarine goes to the top of the water and throws a little powder on the ship, and then it explodes."

Two men pruning the trees are watched carefully by a crowd of boys below. Someone asks: "What do you suppose they are doing?" Another answers: "I think they are up in the trees looking over the city for Germans!"

3. *Red Cross Games and Plays.* The activities for war relief of the Red Cross appear to strike at once a responsive chord in the breast of nearly every child, regardless of his or her age. Red Cross buttons are quite as much badges of honor as are swords, or guns or helmets. Knitting becomes an occupation at once dignified and universal. For needles, a stick will do. An old shawl is found and immediately a needle is run in and out along the edge, and the 4-year old announces that she is knitting for the soldiers. Even the boys do not find knitting beneath them, and there are scores of returns of boys knitting with pins, needles, wires, sticks, wire hair pins, etc., etc. One boy of 8 walks to school beside a girl who is knitting. The ball of yarn is unwinding slowly from his pocket where he is carrying it very proudly. A girl refuses to knit the "German way." Wounded dolls are rescued by Red Cross nurses and carried away to the hospital for medical attention. A 4-year old girl is preparing to go to France in a few days as a nurse. Red Cross nurses and ambulance drivers hover over the field of battle in the back-yard and dash in gallantly to rescue the bodies of those who fall in battle.

4. *War music.* The war atmosphere is extremely provocative of singing and marching among children; often, however, the older songs are not satisfactory, and they are therefore altered *ad lib.* in the mouths of the youthful patriots. Frequently, too, the jingles are quite original and rhythmical, if not artistic. "America," "The Star-Spangled Banner," "America, here's my boy," and "John Brown" are the orthodox melodies most often sung unchanged. Among children who do not have the skill to actually compose rhymes, monotonous repetitions of "la, la, la" or "hip, hip, hip," always to the march step, are found satisfactory. "America, I raised my boy for you," "America, here's my boy," "I didn't raise my boy to be a slacker" are among the popular versions which are either sung as originally written or with alterations. The "red, white and blue" offers a popular nucleus for elaboration, and is very commonly used as a basis for original composition. "Tramp, tramp, tramp" is a similar stem for extempore development. Two versions of the elaboration of this theme follow. They bear a strong similarity, and doubtless had a common origin, but through the dispersion of juveniles they have been considerably modified.

- A. Tramp, tramp, tramp, our boys are marching.
Marching far away to war.
They have got a pumpkin pie
To 'spot' the Kaiser in the eye,
And there'll never be a Kaiser any more.
- B. Tramp, tramp, tramp, the boys are marching.
Off to Germany they'll go.
They will buy an apple pie
Hit the Kaiser in the eye
And you'll never see the Kaiser any more.

5. *Killing the Kaiser.* In the minds of the children, the great arch-villain, the Kaiser, is the one person in the world most to be despised and rejected of men. A 6-year old proposes that a good dose of castor-oil be given him—"That'll kill him sure!" A 4-year old boy, not satisfied with having killed one Kaiser, devotes a whole day to the business, and when night comes startles his elders with the justly proud assertion that he has killed five Kaisers so far, and has a lot more rounded up to shoot to-morrow. A 5-year old playing on the floor, seeing a Jack o' lantern being flashed against the window pane, exclaims in much alarm: "Quick, papa! Get your gun! There's the Kaiser!" Two boys gazing in a store window, one remarks: "I have a penny to spend." The other advises: "Save it to buy a bond to kill the Kaiser!" Upon seeing an actor dressed after the fashion of a Scotch Highlander come on the stage, a 6-year old girl whispers to her father: "I wish he would go and kill the Kaiser!" A group of 10-year old boys originated an interesting jingle, "Close the door on the Kaiser!" which they chanted proudly together.

And so the hatred of the Kaiser, so often and freely expressed by their elders, finds fertile soil in the imaginative minds of the children, and we find them instituting all manner of plots to waylay, abduct, shoot, stab, drown, hang, disembowel or otherwise cut off the Kaiser out of the ranks of men. Amid the greatest secrecy and solemnity, groups of boys swear eternal and undying hatred of him. In their day-dreams they have visions of themselves obtaining through some stealthy ruse audience with him, and then engaging him in mortal combat, of shooting him, or stabbing him, or dashing out his brains with their guns. Apparently if the reputation of the German emperor among future generations is to be cast from the estimate which young America in the present generation has formed of him, it will be anything but a flattering and enviable one.

AN INTELLIGENCE SURVEY OF A TYPICAL TOWN SCHOOL

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of Iowa

In the spring of 1917 the College of Medicine of the State University of Iowa conducted a very careful health survey of the Wapello, Iowa, public schools. The report was to have been published that year, but some of the examiners went into military service and the preparation got little beyond the bulky preliminary report that went to the authorities at Wapello. This paper is a revision of the Mental Survey Section of that report. It does not include the high school.

Several communities had requested health surveys, and the College of Medicine decided it could best serve all by selecting a typical one, making as thorough and painstaking a survey of it as possible, and working out the results in such form as to be serviceable to all. Wapello, although not the most convenient to the University, was chosen because it was the best representative of the group of towns that had requested surveys. It is a county seat, the center of an agricultural community, and its population at the time of the survey was 1,614. It has no private schools, no predominating foreign population, and very few transient families.

Physical examinations were made by physicians of the College of Medicine, dental examinations by an instructor in the College of Dentistry, mental examinations by the writer and his assistants from the Psychological Clinic, and the environmental investigation and case history data were in the hands of a highly competent school nurse. Teachers gave all possible cooperation and assistance. Each examiner had adequate equipment and the best of facilities, was allowed unlimited time, and was encouraged to make his studies as thorough as possible. The one lack of thoroughness was in the fact that the children were undressed only down to the waists and their shoes and stockings removed for the physical examinations. Only when indications suggested the importance of it and parents consented were they entirely undressed. Intelligence measurements and mental examinations were after all other parts of the survey had been completed and their results made available.

TABLE I
INTELLIGENCE RATINGS

Age on Near- est Birthday	Very Superior	Superior	Average	Inferior	Very Inferior	Total
5		2	2	1		5
6	2	4	8	3	1	18
7	3	2	17	4	1	27
8	4	3	14	1	2	24
9	3	5	14	4		26
10		5	18	3	2	28
11		6	17	4		27
12	2	1	14	2		19
13		7	16	2	2	27
14	1	5	19	3		28
15		2	17	1	3	23
16			7	5		12
17			2	1		3
Total	15	42	165	34	11	267

Table I displays the intelligence ratings from very superior down to the very inferior, and arranged according to the ages of the children. These ratings were based on the Yerkes-Bridges Point Scale¹ supplemented by the form board test and others and by a study of each child in the light of his physical condition, his personal history, his family history, his school history, and his general mental behavior. The ratings are therefore much more accurate than unmodified quantitative ratings according to a mental measuring scale.

To guard against injustice to individual children, all doubtful cases were thrown toward the average. For instance, if there was doubt as to whether a child belonged to the "very inferior" or to the "inferior" group, he was placed in the "inferior;" if there was doubt as to whether he belonged in the "superior" or in the "average" group, he was placed in the "average." It is less serious to label a child as average or near average when he belongs at an extreme, than to make an average child and those who have to deal with him feel that he is unlike other children by labeling him extremely bright or dull.

The five and six year old groups show a low proportion of "average" cases. This is due to the tendency of all mental

¹ Some of the Yerkes-Bridges questions were given in the upper grades in group test form. The plan had been developed by the writer as a means of saving time in earlier school surveys. It was submitted to Dr. Yerkes before the Wapello Survey was begun, and met with his full approval.

measurement results to scatter widely with young children, and to the fact that individual differences are more noticeable in young children. Further, school training tends to bring children to a common standard and to eliminate variations and atypical features.

Another irregularity in Table I is in the fifteen, sixteen and seventeen year old groups, there being no "very superior" and but two "superior" cases. The reason is obvious, namely, that those of these ages who were of higher intelligence had passed on out of the grades into the high school and so were not included in this part of the study. Other irregularities in the table are due to the limited number of cases. In general distribution it is, for so limited a number of cases, quite regular through all of the ages from seven to fourteen.

TABLE II

School Grade	Very Superior	Superior	Average	Inferior	Very Inferior	Total
Not in school					2	2
Kgtn.	2	4	9	5	3	23
I	2	4	23	2	1	32
II	2	2	16	7	2	29
III	5	5	19	3		32
IV	2	8	17	2	1	30
V		4	24	7	2	37
VI	1	3	11	3		18
VII	1	7	23	2		33
VIII		5	23	3		31
Total	15	42	165	34	11	267

Table II shows the distribution of ratings by school grades instead of by ages. The two "very inferior" not in school were low type feeble-minded, of school age but not fit to attend. The kindergarten ratings show the low proportion of "average" cases that was observed above in the five and six year old groups. The one conspicuous irregularity in Table II is in the Fifth Grade. The large proportion of inferior children here is due to sorting by the course of study, which sets a barrier at the Fifth Grade which cannot be passed by extremely dull children. Consequently the Sixth Grade is small in numbers and several boys and girls of inferior ability, who might otherwise have been there, have dropped out or were retained in the Fifth Grade. There was a special row of seats in the Fifth Grade for these larger pupils.

Of the 267 children, 15 were rated as very superior in in-

telligence and 11 as very inferior; 42 others were definitely above the average, and 34 were definitely below. The other 165 were rated as "average." The criteria for these five groups are the generally accepted ones, but it is perhaps well to discuss each. The 11 "very inferior" include the feeble-minded and the extremely dull. Such individuals are social rather than educational problems. A school's responsibility for them is limited to directing the institution cases to where they should be cared for, and to training, so far as is reasonably possible, the others for the grade of vocation and life to which their mental limitations will hold them. The "inferior" group of 34 is a mixed lot, but the majority of this type are never able to do good work in school or to rise high in the plane of living. A few would probably rise to the "average" intelligence group if their physical ailments were cured and their home care radically changed, but the greater number have irremediable physical defects or have an hereditary lack of mental ability. The "average" group of 165 includes a wide variety of types and a considerable range of ability, but none of its individuals are conspicuously dull or conspicuously bright. They are the ordinary boys and girls according to whose ability the curriculum is planned and lessons assigned. Nearly all get along better in some subjects than in others, and they often need individual help. The "superior" group is made up of the so called "good" or "bright" pupils, who do their work easily and well, and who usually achieve what we wish that all children might achieve. They do more of the reciting than the average, really carry the burden of the recitation, require little individual help, and as a whole are the ones who are best off when milled through the curriculum in the established routine. The 15 "very superior" have unusual endowment. The curriculum is too easy for them, and they chafe under the graded routine and rate of progress. The problem is to give them sufficient worth-while work, to keep them from over-working at tasks requiring long sustained effort, and to prevent their becoming spoiled and conceited.

So much for a general consideration of the survey results in terms of intelligence ratings. Attention is now invited to the results of clinical diagnosis as shown in Tables III and IV.

The distribution of clinical types by ages would add but little to the information in those two tables, so space is not taken for it. Of the 267 children, each of the 109 shown here gave evidence of mental peculiarity or of a hampering factor. Presumably the other 158 were developing as nature intended them to. Some of the 109 were of course mild.

TABLE III

	Very Superior	Superior	Average	Inferior	Very Inferior	Total
Feeble-minded					3	3
Dull				1	7	8
Environmentally hampered			3	18	4	25
Physically hampered			38	28	11	77 ^a
Pedagogically hampered			9	5		14
Psychopathic		1	4			5
Nervous	2	3	8	6	3	22
Over spontaneous			6	10	4	20
Lisper				2	2	4
Stutterer		1		1	2	4
Epileptic					1	1
Total peculiarities	2	5	68	71	37	183
Total individuals	2	4	50	39	14	109

^a A total of 1040 physical defects were found by the medical and dental examinations, but only these 77 seemed to be interfering seriously with mental development.

TABLE IV

	Out-side	Kgtn.	I	II	III	IV	V	I VII	VIII	Total
Feeble-minded	2			1						3
Dull		3	1	1		1	2			8
Environmentally hampered		5	3	6	3	3	4	1		25
Physically hampered	2	7	7	14	5	6	17	3	7	77
Pedagogically hampered			2	1		4	4	2	1	14
Psychopathic			1	2			2			5
Nervous	2	2	3		5	5	1	2		22
Over spontaneous	1	3	3	4	1	1	4	1	2	20
Lisper			2			1	1			4
Stutterer	1			1			2			4
Epileptic				1						1
Total peculiarities	8	20	22	31	14	21	37	5	11	183
Total individuals	2	10	13	17	9	12	23	4	8	109

Here again is found what is to be found in any ordinary school. Always the largest number is hampered by physical causes, many by faulty environment, many are mild nerve cases, and many have the fault of over-spontaneity. Again the distribution by grades is less important than the totals.

These 109 children carry 183 peculiarities, defects and ailments having a noticeable effect on intelligence. In more than half of the 109 only one factor is potent, but in some there are as many as five. For instance, one of the feeble-minded children stutters, is physically hampered, functionally nervous and over spontaneous.

The various types, defects and peculiarities are defined and the causes suggested by their names. So we may proceed with a brief discussion of the distribution of each in the tables. No *feeble-minded* child can be above very inferior intelligence or make progress in school. One of Wapello's is an imbecile who has never been sent to school. Another is a moron who has attended for a few weeks and who was excluded by the school authorities. The third is an epileptic who has attended second grade irregularly but is accomplishing little. Most of the *dull* are in the "very inferior" group. In fact, some of them are border-line cases and may later prove to be feeble-minded. No *environmentally, physically or pedagogically hampered* children rate above "average." Several of them, however, would have passed into a higher intelligence group if they had been relieved from the hampering factors. The *psychopathic* group is a small one, of average intelligence or better, as would be expected. *Nervous* children are distributed through all grades in school and through all grades of intelligence. Apparently a child may be seriously nervous and yet highly intelligent. This type should have been divided into the organic and the functional. *Overspontaneity* does not permit of a display of high intelligence and is found in some of the lowest. The *faulty articulation* cases are of low intelligence. This is usually the case but there are many exceptions,—speech defects in children of high intelligence. *Stuttering* is almost as frequent in the highly intelligent as in others. *Epilepsy* is usually associated with low intelligence or produces it, so the one case listed here is not misleading in its location in the tables.

Discussion of these four tables is by no means exhausted, but we shall close by inviting attention to the evidence in the tables that children of low intelligence tend to have the most peculiarities and defects. The two "very superior" children in Table III are there, only because of nervousness. The four "superior" have but 5 peculiarities and the fifty "average"

but 68 altogether, while the thirty-nine "inferior" have 71 and the fourteen "very inferior" have 37.

CONCLUSIONS AND RECOMMENDATIONS

"There were the usual number of children suffering as to mental development because of neglected or overlooked physical defects and ailments. This calls for the permanent services of a school physician or at least of a school nurse. Considerably less than the usual number are hampered by poor home environment, but there are the usual number of over-spontaneous, over-active, high pressure children from well-to-do homes.

"There are not enough atypical children demanding segregation to warrant the establishment of an ungraded room. An auxiliary teacher is recommended. She should have training in clinical psychology so as to be proficient in the administration of mental tests and in the diagnosis of mental weaknesses and peculiarities. She should have experience in primary teaching and some teaching in other grades. She would spend most of her time helping individual children sent to her from the various rooms, individually or in small groups. These would be sent for the following reasons and others; to make up lessons missed by absence, to get help in some special subject or topic, to be given training because of general backwardness, or to be pushed ahead in preparation for skipping a grade. She would direct the handling of every atypical child, and she would therefore examine and keep in touch with many children whom she would not herself teach. She would keep in close touch, at least in an advisory way, with the parents of feeble-minded children, would clear up speech defects, and work in close cooperation with the school nurse on physical and environmental cases. She would follow the over-spontaneous children through their special care and training at home and at school. Under her direction and with her help regular teachers would be able to do much more for certain individuals. Finally, she would assist the superintendent in planning adjustments to meet the needs of individuals and groups that happen to appear, such as those in the present Fifth Grade. The auxiliary teacher, then, would be on hand permanently to attend to whatever might be needed in the way of mental hygiene and mental health in the school system."

SUMMER CAMP AS EDUCATION FOR LEISURE

By A. E. HAMILTON, M. A. (Clark '12)

I am assuming without argument that the fundamentals of character are formed not so much under the pressure of routine school-work or business task as under opportunities for choice of action, under the freedom to do as we like, under the chance to follow our feelings where they lead.

The ideal of the best educational summer camps is to give boys and girls real character-building stuff through the training of the feelings and emotions through wholesome choices after the nine months of intellectual exercise and "mind training" in the school-room.

Camp taps the primitive impulses like nomadism, wanderlust, fightiness, shelter-building, home-making, hunting, cooking, etc., and gives them channels for wholesome expression in ways which, while training mind and body, also, and more importantly, train the feelings and emotions healthfully. Camp is, at its best, essentially a spiritual institution, and that without necessary reference to any theology or ism whatever.

Camp brings a boy romance, adventure, pioneering, exploring, the joy of accomplishment through hardship, the excitement of the woodland chase of "enemy" or "game," and the thrill of loyal team work in war-canoe and inter-group competitions.

Stars, clouds, moonrise, night noises, from gentle borings in wood to the call of the whippoorwill, grey dawn, rose dawn and birdsong in the morning, glimpsed and listened to from the blanket bed on pine-needles or sand—these things draw out the dawning soul-stuff in a boy or girl and leave an impress that will never wear away.

And Camp trains the feelings to choose things wholesome, to like things that make for health of body and mind, the life more abundant.

The biggest contribution of summer camping for boys and girls is probably going to relate to the increasingly vital problem of leisure time, and the use of leisure.

The ideal summer camp, as Doctor Gulick has pointed out, affords opportunities for choice of activities, it presents attractive temptations to wholesome actions and occupations. It leads by positive magnets so arranged that one's individual

choice determines largely his or her course of training. And it is essentially a training in the selection of things one wants to do in his leisure time.

For camp is essentially *scholé*, leisure. It is a harking back to the old Greek ideal of what a *school* should be. And in proportion as its range of choice includes activities that are positively good, physically, mentally and spiritually, camp will succeed in contributing to the larger problem of adult leisure later on.

There is always an undertow of distant sociology to contend with in thinking camp. What do we want an eight hour, seven hour, six-hour day for? What are we going to do with it when it gets here? What are we going to cram those extra hours with? What recreations are we going to choose? What relaxations? What avocations, joblets, artistry, schooling?

And I'm more and more inclined to think that the things we learned to like to turn to when we were kids largely determines the direction we turn in later on: craps, cards, hanging around with the gang, shooting, trapping, sailing, canoeing, book-binding, drawing, reading, storying, exploring, riding, movies, prize-fights, sewing circles, receptions, teas, tending babies or hunting bricks for the temple of science.

In selecting the summer camp as a training ground for the feelings toward wholesome leisure-time activities, I am in one sense unfortunate in having to choose an institution thus far limited largely to sons and daughters of the "leisure class," for, however hard their daddies work, they are the kind of daddy who can take a vacation if he wants to, can indulge coin collecting, picture hunting, new automobiles, golf or camping if he likes.

But many of the same principles apply here as will apply to our camp for youngsters of all stations of life in the coming units of our more enlightened educational system, free to all and as necessary a part of training for life as any regular "schooling."

So I take camp Timanous (the boys' unit of the Luther Gulick Camps) as a microcosmic sample, and will concentrate on it, and its activities in lieu of reviewing the wider field of camping in general.

The principles that apply to a boy's camp apply in substance to camps for girls. There are divergencies, of course, but boys and girls of camping age have so many likes in common—the water, swimming, diving, aquaplaning, sailing, canoeing, boating; horses, pets, shelters, fires, games of running and throwing and batting; modeling, drawing, painting, making things of metal and wood; nature lore, woodland hikes, cook-

ing, exploring, gypsy-trips, that the things they differ in are almost negligible when it comes to general principles of direction of desire and the furnishing of opportunities for choice of activity and occupation.

A first class camp must have, to realize fullest possibilities:

1. A location bringing with it (a) good water facilities for water sports (b) woods for play, and to furnish wood for fires, shelters, etc. (c) open space for play and games (d) a small garden-farm for food culture, (e) a barn for horses and perhaps other animal pets, chickens, a cow, rabbits (f) fair play for whichever are the cooling breezes in summertime, (g) isolation, insuring freedom from much intrusion.

2. Sanitary features of (a) pure drinking water (b) thorough and quick disposal of garbage and waste (c) dryness of sleeping quarters (d) relative freedom from bugs, mosquitoes and other summer annoyances of the kind.

3. Housing, simple, primitive but thoroughly protective against rain and storm. Beds simple but essentially comfortable for sound sleep's sake.

4. Thoroughly efficient kitchen equipment, competent cook, adequate assistance, ease of access for supplies, effective and roomy refrigeration.

5. Sports equipment (a) simplest of gymnastic supplies for spare moments—mat, horizontal bar, rings, trapeze, (b) sail, row, motor boats as occasion requires, canoes, rafts, diving tower, chute, etc. (c) Horses, wagon for gypsying. (d) Boxing gloves for boys (e) rifle and rifle range, (f) athletic field-equipment if really called for.

6. Provision for hand-craft, be it carpentry, clay, copper-work, drawing, decorating.

7. A definitive program for the accomplishment of definite and, whenever possible, measurable results, physical and mental by each individual boy. Plus a provision for letting the boy see recognized and recorded his own accomplishment (bulletin board, merit badges, etc.)

8. A spiritual standard underlying and permeating all camp activities, with a certain daily formalization, in song, story, prayer, or otherwise to keep the fact of the underlying standard alive in word and action.

9. A directing personelle that will attract to camp the character and quality of boy that will keep pace with its best traditions, perpetuate and add to them.

This last is first in importance, minimizing the importance of location, equipment and even program by comparison, and often compensating for serious lacks among other desirable requirements.

In starting a new camp perhaps the capital item is the establishment, the setting up of traditions. Largely they must be assumed to exist already. Provided a desired tradition is in accord with the fundamental workings of a boy's mental and spiritual mechanism, it can be assumed, and put up to the boys as a thing to be taken for granted. "We are accustomed to do this here"—"it is camp practice to do this"—and the thing goes.

There is a vital difference between routine program and traditional activity. Rest hour, or going to bed for a "sleep" after dinner is a matter of enforced routine, a certain amount of which boys will swallow with the good things of camp. Boys do not invent and perpetuate the "tradition" of rest hour. They soon fall into line, take it as a matter of course, and go through with it without protest—but just announce that rest hour is wiped off the slate for a day and see what happens! Rest hour is an institution, not a tradition.

Sharing marshmallows around the fire instead of keeping them to eat by yourself, is a camp tradition, initiated by the Director, but seized upon and perpetuated by the boys who find it to their own interest, individually and collectively to perpetuate it. It is more fun, more boys share the good things, and the donor gets a cheer and the approbation of his tribe,—and less stomach-ache.

The Director of Camp Timanous had four philosophical principles of camping in mind which he wanted to make traditional with the boys. They were:

1. To tell the truth
2. To obey first, discuss afterwards
3. To hit hard (task, or opponent)
4. To share good things with others.

1

Only one boy deliberately lied to the Director during the summer. He did so publicly, declaring that he had not asked to ride in a motor boat when, just a little time before, he had. Publicly he was accused of lying, on the spot. Publicly he had to admit it. He was cut off from the motor-boat ride, kept aloof from the Director for an obviously long time, and admitted to grace again only after probation and a demonstration of genuine willingness to compensate for a grievous wrong. This object lesson sank in under the skin of the whole group. It was concrete and definite.

In court, for the boys administered their own justice (though unconsciously directed by their Chief), a distinction was always made between an exaggeration, minification, slight

distortion or mistaken judgment in regard to truth, and the lie. The boys sensed the difference. There was play and leeway for boyhood pragmatism in regard to abstract truth, but there was no mistaking the selfish and deliberate lie. Court rubbed this in. Councilors and Chief, who, as on a par with the boys, were allowed discussion in court, took these occasions to make patent in words the "tradition" of truth, and if allegory or story helped, it was brought to bear not as an isolated moral lecture, but as an integral play of the court drama that was being enacted.

Bragging was treated summarily.

W bragged. He was officially dubbed "Big Mouth" by the boys and so called until a week before camp closed when the boys, around a little fire in the big tepee voted to burn the name "Big Mouth" on a piece of bark and, with only one dissenting voice, this was done. W. had earned back his name. But his bragging, and that of others, was always distinguished from the lie. The word liar was not used at camp after the first week or so.

2

The big war-canoe seated twenty boys. A perfectly safe craft in smooth weather, it was well at least to regard rough waves as dangerous. If boys talk while paddling they cannot hear orders. An order may mean safety or danger for the group. Therefore "no talking." This was a hard lesson to learn. There was always an excuse for words. "Johnny splashed me, Jimmy is out of stroke, Billy's paddle in the way." But these things had to be borne until the next rest period, when they could be discussed. Team work of this sort, all stroking together to the rhythm of a song, or the skipper's "stroke, stroke" brings a discipline of mind and body that is in itself valuable, but it also makes concrete, practical and obviously necessary the rule of "obey first, discuss afterwards." Other camp activities rubbed this in, but the war canoe is the most typical instance. The boys recognized the value of this discipline to themselves, they started it as a tradition of their own, and after a few weeks of practice it was the boys who brought offenders to time for infringing *their* tradition.

3

Boxing made concrete the value of *hitting hard* if one hits at all. That slogan of Roosevelt's became fledgling camp tradition, with a starting point in the ring. All the boys looked on at the boxing matches or the "grudge fights," as it was desired that they should all get the benefit of the instruction

that went with the match—hit hard, look squarely in the eye, keep guard up, lean forward, etc.

Charles picked fights with Tom. When caught he was brought by the boys to the ring, at grudge-time, and they battled with the gloves. Charles hit soft, Tom hit hard and straight. By the third round it was customary for Charles to shed tears and quit. That was in early July.

In middle August Tom and Charles were in the ring again. The results of dinning our motto into the ears of Charles began to appear. By the third round Charles was fresh, Tom was tired. Charles was hitting straight and hard. He was heavier and had a better reach—and had learned how. Round four found the tears in Tom's eyes. In round five Tom was ready to quit.

Now the moral effect of this battle was more far reaching than the Director had hoped to be able to measure. Charles was the baby of camp, living a solitary life, attaching himself to older folk when possible and trying to avoid "being the goat."

A week after the victory in the ring six different boys came to the Chief, who was frying bacon, asking for Charles. Something strange pervaded the atmosphere. Boys didn't usually hunt for Charles.

The Chief left his bacon and went exploring. In an old boat on the beach he found some fifteen boys playing pirate. Charles was captain, giving orders, appointing middies, stokers, pilots, mates. Everyone was going to Charles for orders. He was in his glory. His face shone like that of the traditional angels. He was radiant.

That play lasted until dinner time, and it began soon after rest hour, with Charles still skipper. He was hitting his job hard, giving orders hard, scolding hard, just as he had hit hard in his fight with Tom.

Hard and soft began to be catch words in the group, and the tradition took root, not through this fight, or this skipper-ship, but through the persistent injection of the slogan, concretely illustrated into the atmosphere. The tradition began to carry itself.

4

Candy was allowed only when shared with all after meals. Marshmallows were allowed at roasting fires. The tradition of the roast grew. Boys wrote home for marshmallows in preference to all other sweets, and shared them around the fire, learning in the process of spearing them on another boy's stick the truth of its being better to give than to receive.

The court afforded opportunities for generous treatment.

To temper justice with mercy was found to be pleasant, and this, too, began to take root as a tradition.

T came late to camp. He hit W over the eye with a club. Court sentenced him to a hard punishment unfitted to the crime. The Director spoke in court of the unsuitability of the punishment and referred to the custom of fitting punishment to crime (a custom which hardly existed, but which was desirable, and in accord with boy nature, and therefore that "went through") and also pointed out that T was not familiar with the camp tradition that clubs were no longer fighting weapons of man. That tradition was new, but it also took hold. T was grilled before court as to motives and action, confessed his sin and was saved. Two traditionlets were launched that persisted, and another way to be generous was made patent.

At table the tradition of being generous was watered by spoken recognition of generous or courteous conduct, and a pennant was awarded for special persistence in this direction. It was not so much good table manners that was aimed at here, as it was the strengthening of the tradition of generousness in an egocentric little savage, which the boy of eight to eleven usually is.

These are just a few homely illustrations of the way traditions took root and began to grow. Now traditions are the result of a continuum of conduct, they are attitudes and acts repeated by individuals and groups. And the stimulæ that fall on the individuals affect traditions mightily.

Three stimulæ, to use the language of the psychologist, stand out fairly clearly as important in the moulding of camp traditions:

1. The stimulus of the group
2. The stimulus of success
3. The stimulus of failure

The chief value of camp to the boy, as contrasted with however favorable a set of family-vacation circumstances, lies in the stimulus of the group, a thing that no amount of private tutoring, elaborate equipment, individual liberty can take the place of.

1

A few boys seemed to wade right through camp without very much apparent reference to the stimulus of the group in the accomplishment of definite ends, while with others the reverse is true.

B swam to the rock (first test) alone, he was cheered afterwards, to be sure, but he went ahead by himself, practicing, until he made the raft all unbeknownst to us. Later he had

swum to the island, then around the larger island, (half a mile) and finally he asked permission to try swimming to Ship Island, a mile away, and, though but eight years old, made it in as good form as the older boys of twelve and thirteen. He would have continued right along for indefinite distances if he had been allowed. It seemed a personal, solitary thing with him, a set of accomplishments that he might as well have undertaken if camping alone with his family.

S tried swimming to the rock only under the most prepared and dramatic of circumstances. Attention of everyone was called to the trial, he advertised it beforehand, seeming to endeavor to bolster himself with the stimulus of onlooking eyes.

M always did his best work when he was the center of attraction, he attempted new things, did old things better and seemed to draw on all his vital reserves when he had an audience, when he was in the crowd.

L was never spectacular, but seemed to feel the admiration of the group, and to respond to it with further endeavors. He watched the chart recording successes in the water closely, made copies of it, wanted the original to take home. He was the best swimmer in camp, but was shy and retiring and silent about it.

Boys attempted the swim to the rock best when in groups of three or four, with others watching. Fear seemed divided up, less concentrated in any one boy. Dislike of public failure added an obvious element, and the competitive atmosphere (though it was not an actual race) stimulated still more.

S, however, would never join a group. He always wanted a single counselor with him, and the track clear for a lonely attempt. But he wanted his attempting known, far and wide.

Many more boys attempted sliding down the chute for the first time when the group was on the raft, than when they were invited for a solitary trial. Taking the first dive, with but two exceptions, was definitely eased by the presence of watchers though W practiced in solitude until he graduated from the crass belly-flop and worked up nerve enough to leap from the tower. B went to the rock alone, practicing dives until he was not ashamed of them.

And here the indirect influence of the group doubtless plays a rôle—the boys are practicing with the group in mind, and do their best work after all, when eyes are upon them.

Boxing is always of a higher order when the group is present than it is in the practice ring. Even practice is helped very measurably by having a number of boys present. Both single pairs with instructor and pair with instructor and groups were tried out alternately during the summer, and the

atmosphere was as different as one would presume it would be under the two sets of conditions.

Such a fact is quite simple and apparent, yet I have had fathers of boys tell me their sons need nothing from camp, they have everything provided at their summer homes, boxing instructor, horses, gymnasium, water, food. I wish they might see the relative intensity of work and play in their own boys under those conditions, and under the stimulus of the group; how much more of their margin of power is used when the gang is around, how close they draw to the very limit of their usually unused forces of will.

And in all this group stimulus, the underlying motive was constantly emphasized of *hit hard*. The group-stimulus, perhaps more than any other factor, helped cement this tradition into an enduring foundation. One cannot measure or weigh traditional values. One feels them in the atmosphere, senses them in boy responses.

2

The stimulus of success is closely linked with the stimulus of the group. A boy who is successful in a group wants to stay successful, and that means progressive accomplishment in camp. "Hitting" a thing hard and persistently enough usually brings this to a boy. Success breeds success in all but a very few.

B was a good swimmer to start with, but he tackled each individual water-stunt until he had completed them all and became a Shark. He thrived on success.

J won his paddle by persistent trying until he reached the goal, but he saw no further than the concrete paddle, rested on his laurels, used his paddle for a sand shovel, lost it to the Chief and had hard work recovering it.

E was told that he could gain weight, improve his angel scapulæ, round out his chest and harden his muscles if he would persist in a regime outlined by his counselor. In a month he gained five pounds, tested out far in advance of his former abilities muscular and found his chest delightfully rounding. (He was most hollow-chested and scrawny when he arrived.) Success drove him still harder into his program. At close of camp his shoulder blades were practically normal, his chest was wonderful to behold (he had the chest, and had only to get it into position) he had gained almost eight pounds, and actually got into games, swims and mischief. He followed his regimen of bed-exercise and table training largely because he felt the success of the effort and was constantly told how successful that effort was. Only an initial attention

was called to his defects, the rest was all harping on accomplishment. He radiated success.

But the real success, as viewed by his Chief, was spiritual rather than physical. A letter came from the boy's mother rejoicing over the boy's changed physical appearance, his surprising improvement of poise, posture, hardness and chestiness. But the real value that the boy had from camp was the attitude of success through having hit his particular problem hard, and stuck to it, hitting hard. This attitude, I believe "transfers" to other fields, "transfers" wherever desire links with will for the attainment of an end. It is this attitude that the camp tradition was launched to cultivate and fix.

And I incline to think that the same traditions, the same attitude, the same habit ought to apply as well to our use of leisure as to our use of working time. I'm hoping that just as there may be transfer of attitude and intensity of effort from the summer camp recreation to school activities, there may be also a return in kind and in modified intensity to these primitive absorptions of boyhood later in life as recreative "rest" and amusement.

But to intensity of effort, we must add technique. A great deal of failure, with its stimulus and its backdrawing, comes through lack of skill, or physical handicaps that limit the acquirement of skill.

3

A told us he took boxing lessons from Benny Leonard's trainer. J pummelled him around the ring until A began coughing and gave up.

A was merely too heavy. He had technique, but carried the incubus of twenty pounds overweight. Sheer physical inertia turned his "I can" into an "I can't" that was not uprooted as to boxing, all season.

Training down this lad to normal would, I believe, not only release his technical ability to box well and effectively, but would revolutionize his attitude toward not only boxing but a score of life's activities.

He tried to be helpful in the kitchen. One day he spilled a bucket of water over the floor. The cook told him he was too fat to fetch water, and never to try to help again. He never did—and another "I can't" was registered.

The stimulus of failure in his case was very faint. He failed, and ever so much as he might want to try again and succeed, the fates of adiposity were against him, so he turned to sand forts, shelters, writing letters and other occupations that tended to aggravate his condition of fatness. In working

against these tendencies, and toward the things the boy needed, the Director had to contend not so much with lack of desire as with physical "I can'tness."

On the other hand, in boys whose build was right, failure sometimes acted as a boiler fire inside, keeping up pressure and increasing effort.

W thrived on failure to make a good dive. He grinned at every belly-flop, let every sting act as a spur to another spurt, kept everlastingly at it until he made a dive, dived from higher and higher places until he made the jump from the top of our tower and was cited for "nerve."

J failed to swim to the rock for seven weeks. He "gritted his teeth" as he called it, after every failure, and declared he would make it yet. He had periods of despair, but hope and the sting of failure kept him at the task until, during the last week of camp, it was done. Failure in his case was as consistently persistent a stimulus as there was. There was little marked improvement in distance swimming, it was a matter of lack of hitting hard, keeping at it. One day he tided over that node of failure and got there. The distance itself proved easy after that.

However, his failures never met with recognition as failures on the part of councilor or director. He was always told, and most insistently, that he could do it. He repeated the words, telling himself that he could, and "gritting his teeth" about it.

Whatever values there may lie in the stimulus of failure, it is camp principle to create an atmosphere of success or possible success, and ever maintain it in hope and faith.

This applies as well to technique, as to mere accomplishment of a thing in the gross. "To do the thing in the best way, instead of in any old way," is a camp motto, and a boy is not successful until his dive is first class, until his stroke is A1, until he handles his paddle in good form, until he can build a fire that fits its peculiar occasion or function, until he can roll a poncho or make a hike-bed that is a work of art in the field of comfort. More and more am I convinced that to learn during a summer to do a few fundamental camper-things thoroughly well, is worth more than the happiest variety of sampling experiences.

IMITATION

Imitation plays an almost ridiculously obvious rôle in camp life, and can be turned to account in the forming of traditions as few other powers may be.

A carpenter bench is a good thing in camp, but it is sterile unless some generic occupation is started spontaneously, or with the appearance of spontaneity, within the group. The

Director's technique here consists in watching his boys and seizing the cue they give.

J built a grotesque little boat with a huge and impossible paddle-wheel. He came to the Chief for a rubber band to make it go. Someone saw him. That afternoon nine boats were under way. Next day the carpenter-bench and tools were made available to B who built a first class boat. A prize was then offered for good craftsmanship. It was found immediately that those who learned to use the tools did better work. The tools were in pressing demand.

Aeroplanes, boomerangs, arrows, cross-bows, rafts, spoons, seem to have their "seasonal" occurrence. Sometimes the initial point can be traced and found, sometimes the contagiously imitative interest seems to come from nowhere. Nurtured while it lasts, it helps enormously to fill camp time profitably. Neglected it peters out or becomes banal.

Spoons forgotten on a camping trip. The Chief carved one of driftwood. Others followed, and competition arose in craftsmanship. No carve, no spoon to eat with, "ghoulash" for supper, not much fun fingered. Ergo—an epidemic of spoons roughly hacked out, but with a tide-over to the workshop where creditable spoons were made, and later even decorated and kept as camp mementoes.

So spoons could easily become a camp tradition, saving tableware, making a tool intensely personal, developing the spirit of art-craft and channelling off the mere whittling instinct into definitely constructive uses.

NATURE LORE

Not "nature work" or "nature-study," but a concrete, seeable, handleable collection of bugs or butterflies, mounted on wooly cotton and pressed against passepartout'd glass, grounded the tradition of nature lore.

It was simply "customary" to make a collection of butterflies.

L made the first collection, exhibited it in its glass box, got credit for it on the bulletin of achievements and—set the pace.

L was one of the brightest boys in camp, twelve years old, clever with his fingers as well as with his brain, a sure shot with the net and possessed of an enthusiasm for capturing things.

But the two youngest boys in camp made little bungling collections, and were helped to frame them, and were just as proud and happy.

There was nothing savoring of the "class" in nature study.

Boys went up to the farm if they wanted to, swung their nets, took messes of bugs and butterflies to the Nature Lady "Mother Nat" who told them what they were, helped classify and arrange them and, when their names and something of their habit and use or un-use was learned, she recommended them for nature honors at headquarters.

A class in nature study would not become tradition. Making a collection for exhibition on exhibit day, and then to keep it for good, can and does become traditional, goes off spontaneously and needs only a slight attention of encouragement for the boys who do not so readily "take."

Learning trees, ferns, fungæ, mosses, flowers, sea-beach flora and fauna are semi-traditional. The impetus of winning honors through these acquirements, the necessity for frequent reminders, the more nearly intellectual nature of the task (or fun) make this part of nature-lore a borderline case between tradition and institution or program. "Have you learned your trees yet" is not nearly so electrically important a question as "have you swum to the rock" or "have you got your collection yet?"

Boys will classify themselves according to native ability. The difference between Camp classification and that of our schools is this: in camp, ten boys of ten grades of ability may work in the shop, or model at clay, or go hunting bugs at the same time and under the same (teacher) councilor. They belong to the same working group, but by their fruits they shall be known, and on the camp record they find themselves classified according as they merit classifying.

L made a collection of nine butterflies, three male and three female of three different species in a week. J collected two butterflies, a moth and a grasshopper. Both accomplished these results in the same week and on the same nature-trips. But L put himself in an honor class of *Naturists*, while J had yet a long way to go.

And to make the honor of *Naturist* carry with it so much that is attractive to a boy that J will want to come back next summer and try to get in that class, is not only to add strength to Camp's magnetism, but actually to increase the boy's initiative and stick-to-itiveness whenever he is out on the job.

The *Naturist*, returning another summer, does not isolate himself in a "class," he assumes some of the functions of a councilor, teaches those boys who like him and want to walk with him what he knows about birds and butterflies and so makes his own knowledge better tested and vital, while filling at least some of the boys with a desire to emulate him. With the *Naturist* rank go privileges that distinguish the boy, such

as greater freedom of choice in his walks and studies, night-time opportunities for mothing or listening in the silence for new voices heard only at night, permission to sleep in tree-house, and other rights granted in recognition of his good work done.

And, having "majored" so to speak in Nature Lore the summer previous, he may turn to some new elective honor, or honors, Woodcraft, Watersport, Marksman, Athletic, etc.

FEAR

Camp policy nearly merges with camp tradition at times, is one with it many times. A cardinal principle of camp is never to force a boy beyond his desire. To stimulate, to encourage, to make tasks and fun attractive, to lead, magnetize and even gently push, yes, but never to push hard, or pull too strongly. To frighten a boy in the water, hurrying to get him over an initial fear, works much more damage than the short cut is ever worth. But even this traditional policy must not become too rigid.

K was afraid to duck his head under water at morning dip. A week of observing other boys worked no change in his attitude toward the dangers involved. His councilor was allowed to initiate him into the mysteries of under-water, and from that morning on, he ducked.

But this lad was an exceptional case, and called for special treatment in many directions.

He was afraid of horses. He wanted to ride but could not bring himself to mount a horse. After considerable study by the Director and Council, despite his tears and howls of protest, he was mounted and held in the saddle. Soon he stopped crying and began to smile. In five minutes he was thoroughly enjoying the new experience. As soon as he was genuinely happy in the saddle, he was taken off and was not allowed to ride again until the following week when he mounted horse himself and felt thoroughly at home.

There may always be one or more cases of special "intellectual timidity" where an idea has been lodged in the mind about the danger of a thing like water, horses, rifle, boxing. K rationalized his fears and feared his rationalizations. He had heard or learned that horses were dangerous (no history of a previous fear, or scare could be traced) but he merely stated in cold terms that horses were dangerous, not that he was afraid of horses, and hung to the belief until his rather forcible experience changed his mind, when his feelings followed suit.

Usually, however, it is camp policy to be long patient with

initial difficulties, and never to force a boy into anything beyond power and desire.

SONGS

Imitation in constructive directions obviates much of the merely negative in discipline and law. There was no "don't carve your initials in the furniture and trees" at Camp. A boy was selected early as having done good work, he was awarded a paddle, and the right to decorate it with his sign or symbol, a symposium on symbols was held, interest in symbolic trademarks or signs grew warm, and the natural tendency of boyhood to appropriate landscape and property in his own deep carven name was merely shifted to the decorative element in the paddle tradition. Camp was singularly free from annoying petty desecration and the only specific reference to the matter cropped out in a song of a "would be camper"—

He thot the lake would bite him if it got above his knees,
He didn't know mosquitoes from potato bugs or fleas
He used to carve initials on the furniture and trees,
But he's never been to Camp Timanous!

Song merely followed action and encouraged imitation. Morning dip, taking a dive, paddling in tune, brushing teeth, piling wood, sleeping out on the pine needles, getting licked in a boxing match—these and many more, found their way into classic camp songs which doubtless had their sub-conscious effect and added splendidly to the camp morale, or "quality of the spirit of the whole."

"He told of the boxing there, bout after bout,
He said that the best fun was getting knocked out"

— to the rollicking tune of "Blow the Man Down" and linked with other versings that glorified work, success, and failure well taken, established a standard for camp minstrelsy by which all songs could be tested in the future. The song-tradition was pitched high with a definite purpose in the plan and spiritual drive of the whole.

COURT

To make "court" serious was a delicate bit of pitching tradition to just the note desired. Humor must have its place, for even a court must be a living thing, but to make boys realize that this playing at grown-up court procedure was serious business, that it was their own instrument of justice and mercy, was the vital point.

Court tried cases of major discipline. A Judge presided and a jury sat. Lawyers might be chosen, or plaintiff and defendant might plead their own case. There was privilege of final appeal to the Director, but this was seldom, if ever, resorted to. The boys worked out their own cases generally along lines of sound common sense. The fact that their decisions were sometimes guided by participation of councilor or Chief in the court procedure did not seem to make them less the boys' own. They gradually came to believe in the court as theirs, and appealed to it as theirs and took keen interest in its procedure, and in taking their part.

Court uses the stimulus of the group to draw out one's best in defense and attack. The competitive element enters, success gives zest, failure either discourages or puts more fight into a lad, depending largely on his native temperament. The boys learn to talk on their feet. Accuracy of observation is tested in cross-fire of questions, exaggerations have short life, succinct statements of truth swing their full value into the fray, truth itself is tested and found solid. Half truths find hard sailing under cross-examination and tears often take their place.

Infrequency of session is life-blood to court tradition. Only cases of real merit, where it is worth the time and effort of the group, are brought up. Others are squelched quickly, or die before the Court can be called.

PADDLE-SHIELD

This camp, on an inland lake, played up water-sports supremely. Canoeing, boating, diving, swimming, war-canoeing and longer trips here and there on the water meant the focusing of much traditional matter lakeward.

The canoe-paddle was chosen as a focal point. A boy, through variety of effort to accomplish definite items on the camp program might earn for himself a blank, unvarnished paddle, like the blank shields of King Arthur's fledgling knights.

Through further effort and more accomplishment, he earned the right to decorate his paddle with a symbol, or sign which he had chosen as his own after earning the right to possess a symbol. As a special reward for extraordinary merit in his course of accomplishment, he was entitled to decorate the reverse of his paddle with the symbol that stood for his Camp. He might then decorate and varnish his paddle, after which it was his to use and to keep.

This tradition began by giving paddle, symbol, camp symbol all at once, and it was found that just in proportion as a paddle

was made hard to attain through additional effort for the various elements, just so much harder did the boys work to earn it, therefore the gradation of earnings scale.

The paddles also focussed the art-work of the boys. Some needed much more assistance than others. Some boys drew and colored their symbols and decorations many times on scratch sheets before they were allowed to attempt, with assistance, the decoration of their paddles. The way one boy guarded and treasured his decorated paddle was a joy to all who beheld it.

But the most interesting single tradition bearing on the philosophy of Camp, both from the sociologist's and the educator's view points, was the Timanous tradition.

Camp was named after one who lives now only in memory, tradition, spirit. The weaver of Camp songs had never known him face to face, but felt his attitude, his spirit, if you please in the atmosphere:

And for the boys who followed him he fought with all his
might,
He was a leader brave and true,
And he won the hearts of all the folks who came within his
sight,
And of some of us who never saw him, too.

Only two of the boys in Camp had known Timanous (an Indian name for Guiding Spirit given to Doctor Luther Gulick) the rest gathered from a word here and there, from references to his personality and work at morningsong and reading exercises, from occasional anecdotes relating to his life and from the portrait that hung in the main bungalow, that Timanous was a history, a point in the past from which traditions ramified, and abiding influence in the present, though hard to explicitly define, and more felt than understood.

I may have read it into the atmosphere myself, but I felt that here, in actual practice, within a group of "little savages" one could note the evolution of the ancient tribal God, or great ancestor, or revered Chieftain who lived on through generations of traditional heredity, speaking through the lesser and more immediate leaders of the present time.

This very fact of personality gave body to the traditional background of Camp in its spiritual essence, for, though seldom referred to consciously as the embodiment of such traditions as I am making the main theme here, it was generally felt that he did embody them, stood for them, gave them their initial velocity and would be pleased to find them working out today.

And this has appealed to me as a most wholesome, concrete and uniquely personal hero-myth. For myth it is carrying the core of solid truth that all perpetuated myths are centered by, and being here essentially local, palpably possessed by the immediate group, or tribe.

Fortunately "Old Chief Timanous" as Camp song had made him familiar to the boys, had left a wealth of immediately applicable camp tradition-stuff that could be known as coming directly from him through those leaders and councilors who had from him inherited ideas, ideals and enthusiasms. He had also left his written words, in books, and these were read by councilors who read with sympathy, and who could not help radiating something of the same spirit that animated those words when they were written.

Two of the council had vitally experienced in action the substance of one glowing paragraph which bears quoting here, so germane to the subject it is:

"Friendships demand the focussing of the attention upon each other—there is no friendship without acquaintance. For this reason doing things together, having mutual interests, is a common mode for the formation of friendships. There seems to be something almost magical in the common things of life to draw people together. Doing those things together which all the people of all the world have done together; experiencing the common feel of earth under one's feet, the look of green trees, the touch of fresh water; cooking in the open; sleeping on the ground about the camp-fire; carrying the pack; standing the strain of the long trail—somehow human nature seems to come right to the top and look around under such conditions as these. You somehow don't need to become friends—you just are friends . . . It seems as if sham, insincerity, false courtesy and other pretenses are swept away by the sweat that pours from the body and you and he stand before each other for what you really are . . . Under such conditions souls fuse."¹

And so, through councilor and Chief acting out in their several ways as much of the spiritual tradition laid down for camping by Timanous as they might, the myth was nurtured and has begun its growth. And here Camp Tradition and the larger matter of Leisure Time draw close together.

Here we have much of the spirit of a personality who has lived out, spoken and written out a great deal of the very best not only of camp lore, but of life-lore itself, pouring itself into a dynamic mould, the camp unit. We have councilors who have lived through such friendship forming experiences

¹ The Dynamic of Manhood. Dr. L. H. Gulick.

as Timanous has described, and happy to see other boys tasting the same rich joys. We have boys subject to these friend-forming influences in the most natural of primitive circumstances; boys doing these things together because they have chosen to, and working into the texture of their inner natures the very stuff of right conduct and of happy human relationships.

And if a man has had this simple philosophy of the out-of-doors and its myriad possibilities of enjoyment ingrained early in his nature, will we not have a more spiritual world to live in? For after all, the very elements of spirituality are here in the doing of wholesome, happy things together because we may choose to do them and the reward in the doing is joy, and peace, and freedom and purity of purpose and all the cardinal points of any attempt at defining spiritual life. And to these concrete things will a man turn in later life when he has a chance, and to these he will want his children to turn, and will work for their opportunity. *School*—leisure and opportunity for happy, wholesome choices will get back its share in our educational scheme of things, and summer camp will have made its larger contribution to the moulding of American character.

IMPRESSIONS OF THE PSYCHOLOGICAL SESSIONS OF THE INTERNATIONAL CONFERENCE OF WOMEN PHYSICIANS

By PHYLLIS BLANCHARD, Ph. D., Clark University

The International Conference of Women Physicians, held in New York Sept. 15-Oct. 25, 1919, by invitation of the Y. W. C. A., cannot but be of interest to psychologists, for two entire weeks of the program were devoted to a presentation of psycho-analysis and its application to industrial and social problems. That the interpretation of this new psychological movement was clear and accurate is vouched for by the names on the program:—G. Stanley Hall, Beatrice Hinkle, Frink, MacCurdy, Kempf, William White, Constance Long, Lucile Dooley, et als. Leland Olds, with his application of the principles outlined by these speakers to industrial unrest, made a unique contribution, while Dr. Eleanor Bertine emphasized their bearing on the problems of sex education and social morality in a thoroughly scientific and impartial manner.

It may be well to note briefly some of the most significant papers,¹ and point out some of the obvious conclusions to which they lead.

Dr. Hall and Dr. Hinkle in their respective papers *Points of Difference between Men and Women, Inherent and Acquired*; and *Arbitrary Use of the Terms Masculine and Feminine*, represented very different viewpoints. For Dr. Hall there are distinct differences between men and women, and if modern woman attempts to use her newly acquired economic and social power in imitation of man-made patterns, she is betraying her biological mission. The whole tendency of the feminine nature is to subserve the interests of self to those of the race; she is innately the great Eugenic force, and her task is now to work consciously for the welfare of future generations as she has always done unconsciously in the past.

On the other hand, Dr. Hinkle, following the Jung² division of mental types into the introvert and extrovert classes, insists that there is no norm which can be called typically masculine, none which can be called typically feminine. Tradition

¹ See list at end of article.

² Jung. C. G. *Psychologie der Unbewussten Prozesse*, 135 pp. Raschlen & Cie. Zürich, 1917.

has insisted that the male be the fighting male, the woman the protective maternal element of society, but in reality woman may be as aggressive as man,—it is all a matter of individual difference, and has nothing to do with sex. The introverted, intellectual mind may belong to either man or woman, and the same is true of the extroverted, emotional nature.

If we think the problem through, we can see that these two views are not so fundamentally opposed, as appears at first. We cannot but admit that the female has had imposed upon her throughout a long phyletic history, the necessity of sacrificing individual interests for those of her offspring. A decrease in the number of forces working for the maintenance of this type by natural selection has permitted an increase of aberrant feminine types, until in our present society there are many women who approach what must once have been the essentially aggressive masculine type, while many men have lost their distinctly masculine traits and approximate the more passive feminine type. The physiological basis for such a change is adequately explained by Blair Bell in his study of the endocrine balance, in which he shows that the degree of masculinity or femininity depends in large measure upon the secretions and hormones produced by the ductless glands and their interaction.³ As Dr. Hall has insisted, the biological sex differences are much deeper and more fundamental than any arbitrary division according to type.

There are certain conditions in modern social life which tend to emphasize the individualistic side of woman's nature and to repress her primary feminine instincts. The vast number of women who cannot find an outlet for their natural desires in love and motherhood and who enter into the business world find no opportunity for the sublimated expression of their altruistic tendencies, but are forced into the ruthless methods of competition which prevail there. Being thus compelled to repress their fundamental tendencies, they build up a defense mechanism which stamps their reaction patterns with all the characteristics traditionally ascribed to the male organism, and which are still utterly foreign to the real nature of the normal woman.

As a whole, the conference was less concerned with any hypothetical question of a masculine and feminine type, however, than with the more practical issue of obtaining an understanding of the psycho-analytic principles which might be applied to the economic and social problems of the day. One of the appalling things their medical practice had

³ Blair Bell. *The Sex Complex*—233 pp. Tindall & Cox. London, 1916.

brought home to the members of the conference was the amount of sexual perversions in modern life, and the need for a new social criterion of sex relationships. The possibility of the roots of abnormal sexual practices reaching back into infancy was explained by Dr. Blumgart, who showed how infantile reactions originally a normal expression of the nutritive instinct may become associated with pathological sexual and erethic tendencies in neurotic children, leaving traces which are never wholly eradicated in after years. Ordinarily these strictly infantile perversions, such as auto-erotic activities, erethic sucking, anal-eroticism, and urethral-eroticism, become sublimated as the child grows older, so that aside from the personal suffering and temperamental idiosyncracies which they entail, they are not a vital factor in the continuance of the race except as they are passed on to succeeding generations through heredity.

More serious, from the Eugenic standpoint, is the problem of homosexuality, which Dr. Constance Long, Dr. Mary Gordon, (both of England), and many American doctors consider much more prevalent, particularly among women, than has hitherto been generally admitted. Instead of placing all the emphasis on the biological side of the question, as did most of the speakers, and treating it as a psychic arrest of the libido in its development, it is to be suggested that, certain economic and social factors be taken into consideration. To-day as never before, women are refusing to marry, and the sex instinct, denied its normal love-object in a member of the opposite sex, reverts to some female companion. It was pointed out that when man becomes isolated from intimate relations with women, as happened in the army training camps and in the navy during the present war, the same homosexual tendency becomes manifest. The ordinary unmarried woman is quite as isolated so far as any normal sex life is concerned, and the libido thus denied its natural outlet, seeks the love object nearest at hand. Now that the opportunity for intellectual and economic equality with man has enabled woman to put on a semblance of masculine traits, such a fixation upon another woman has become particularly easy.

What are the remedies for this abnormal condition in the individual and in society? First of all, a recognition that co-education, whatever its disadvantages, does tend for a normal transference of the libido to the other sex at the critical period of adolescence, and the encouragement of co-educational schools and colleges in place of institutions where young men and women are isolated from each other. With this, there must go a new type of sex education, which shall teach the adolescent

to understand his own instincts and impulses as well as his duty to society and to the race, so that instead of being subject to repression through a moral code dogmatically imposed from without, the adult man or woman will be able to shape his or her conduct in harmony with the best biological and social expression of the fundamental human instincts.

Having a somewhat similar origin to homosexuality, in that it is a result of an imposed control of the natural expression of the sex instinct, masturbation, by Dr. Frink's statement, is even more widespread. The habits of masturbation in the adolescent boy, or of the erotic reverie and fantasy in the adolescent girl, are not physically detrimental as popularly supposed, however. Yet if practiced in excess, and carried over into adult life, they make for certain anti-social characteristics of the personality which may endanger happiness and prevent proper social adjustments of mature years. It is the economic obstacles in the way of early marriages that tends to prolong the sex tension inordinately, and leads to the carrying over of this habit beyond the age when the boy and girl, although sexually mature, are still incapable of producing eugenic children. During these first years of adolescence, when they are still too young for parenthood, it is more beneficial than detrimental from the larger social aspect of the question, since it is preferable to a normal sex-relation if the latter results in inferior children.

Another complicating factor in the development of the sex life is what Dr. Charles Lambert termed the *Family Drama*. Often, the possibility of a happy marriage depends upon finding a mate who will approximate the unconscious father or mother ideal. Too much love lavished upon children, especially upon those of neurotic tendencies, is apt to create such a fixation, and is thus seen to be as injurious as the lack of any affectionate home life. This same principle was put into concrete form by Lucile Dooley in her analysis of Charlotte Brontë, in which she showed the dominance of the gifted author by a father complex which shaped her career and molded her literary productions in its pattern.

Although a rigid repression of the sex instinct with no correlative sublimation has led to the abnormal expressions of the love-life enumerated above, the function of repression in itself has been of great biological value to the race. According to Dr. MacCurdy repression became necessary on the physiological level aeons ago, when our stirp was evolving through the long stages of animal life. For example, when the amphibian made the radical change in its mode of life which enabled it to emerge from its primeval aquatic habitat,

the vast difference between its larval and adult stages made a great deal of repression imperative, lest the stimuli of the new environment be responded to with the old reactions, now wholly inappropriate. Thus the function of repression was for a long time of life and death value to the species, so that it is no wonder that it was preserved by natural selection, and became an integral part of the psyche.

In another paper, Dr. MacCurdy showed that besides the sexual instinct and its repressions and sublimations, there are certain other fundamental human motives coeval with the sex impulse and quite as potent factors in conduct. One of these is the egoistic impulse made familiar by Adler⁴ as the will-to-power; the other is the gregarious instinct analyzed by Trotter.⁵ All through human history, these three groups of motives, however different may have been the expression at different periods, have been the chief determinants in shaping the destinies of mankind. For instance, from the psychological viewpoint there is little difference between the religious attitude of primitive man and the scientific spirit of modern times. Both religion and science are closely related to the sexual and egoistic instincts, and both attempt to explain the mysteries of life and of the universe. Moreover, just as modern man tries to control his environment through the application of scientific principles, so the savage attempted the same feat by means of the charms and magic ceremonies of his priest and medicine man.

Since these motives of sex, power, and gregariousness (to which are attached the other instincts, as fear and anger), have always been the basic factors in human conduct, it is time, as Dr. William A. White remarks, to study them in their various expressions, with a view to making them conscious and bringing them under rational control. The psychoanalysts have been doing this for some time in the case of isolated patients, but it is only recently that any attempt has been made to use the same methods in the diagnosis of pathological social situations. Most noteworthy, therefore, is the keen analysis of the present labor unrest presented by Leland Olds in his study called *Labor and Health*. In order to understand Mr. Olds' work in its fullest significance, we must first review Kempf's outline of the *Physical Basis of Personality*, which is as vital for a complete interpretation of the labor problem as a knowledge of the psycho-analytic doctrines.

⁴ Adler, A. *The Neurotic Constitution*, 456 pp. Moffatt, Yard, N. Y. 1917.

⁵ Trotter, W. *Instincts of The Herd in Peace and War*, 213 pp. Unwin, London, 1916.

To Kempf's mind, the longings recognized by the psychoanalyst as the deepest forces of life,—hunger or self-preservation (also expressed in the will-to-power), sex, gregariousness—are fundamentally cravings of the autonomic nervous system. More simply stated, each one of these desires has a definite physical basis in a painful spastic tension of the involuntary muscles, which makes itself felt by way of the autonomic nervous system. In order to satisfy these unconscious autonomic cravings, the central nervous system and the voluntary muscles were developed, so that the organism might easily move to a new environment more suited to its physiological needs. These simultaneous autonomic cravings form the basis of the "conflict" constantly alluded to by the psychoanalyst, and in the struggle between them, the stronger find satisfaction, repressing the weaker. As soon as the dominant craving is satisfied, however, the others rush forward, and the fight for right of way begins anew, so that our reactions are being constantly determined by the spastic tensions of the involuntary muscles.

There are certain conditions in the life of the labor classes which tend to prevent satisfaction of the autonomic cravings of the personality, and it is in this unfortunate circumstance that Mr. Olds sees the underlying cause of labor unrest. Not only are the nutritional needs of the organism improperly supplied in the case of the working people, but sex longings, and even the excretory organs are denied adequate relief. (One of the things labor asked for during arbitration by the War Labor Board was hygienic toilet facilities and the opportunity to use them when necessary.) Not only have a few people controlled the stimuli which could satisfy these fundamental cravings, but they have established the standards which act as social qualifications of them, so that certain kinds of food, certain types of love-object, are demanded, and the possibility of obtaining them becomes even more remote.

In accord with the principles outlined by Kempf, these unsatisfied cravings have been expressed in a constant abnormal spastic tension of the involuntary muscles, which has resulted in a lowered resistance to disease on the physical side, and a feeling of unrest and compulsion to seek environmental changes on the psychic side. This effect has been cumulative from generation to generation, until we see its climax in the present industrial situation, with the dissatisfactions and strikes of the workers multiplying rapidly on every hand.

In psycho-analytic terms, the physical condition which has been produced in the laboring classes as a result of this over-long autonomic tension, has become the basis of a very definite

inferiority complex, which has been reinforced by the workman's attitude to his employer. Before the day of the labor union and the general strike, the workman had to approach his employer in a supplicating attitude, and this, too, was the cause of abnormal muscular tensions and an additional factor in the formation of the inferiority complex. Moreover, the lack of security for the future ever present in the realization that at any moment business may become dull, and work and wages be taken away, helps to complete the vicious circle which means an unendurable feeling of inferiority.

In the light of this analysis, it becomes clear that the unconscious motive of the labor unrest is the desire for power in order to satisfy the fundamental autonomic cravings and remove the painful spastic tensions implied in their existence. The laborer needs to be freed from all the repressions that have been imposed upon his personality. He must be given a life which will permit full expression of the fundamental human tendencies. Until we can devise an economic system which will provide this, we shall never find a final solution to the labor problem.

It was in reaching this conclusion that Olds struck the note which was predominant in all the discussions of the new psychology,—the principle of self-determination based on self-knowledge. Whatever the difference of opinion on minor points among the psychologists, to this they were agreed: that the time has come to do away with superimposed rules of conduct in every part of the social system, whether in the sphere of labor, or religion, or sex relationships; and to replace dogmatic control by means of taboos with an individual morality founded on a truthful interpretation of human nature, and an understanding of the relation of the individual to the social organism of which he is a part. To any student of psycho-analysis there appears to be no other ultimate solution for our difficulties than the establishment of such a biological and social philosophy of life as a guide for human conduct.

IMPORTANT PSYCHOLOGICAL PAPERS PRESENTED AT THE CONFERENCE

- The New Psychology.....Eleanor Bertine, M. D.
Points of Difference between Men and Women, In-
herent and Acquired.....G. Stanley Hall, Ph. D.
Outline Description of Personality...Geo. S. Amsden, M. D.
Arbitrary Use of the Terms Masculine and Feminine,
.....Beatrice Hinkle, M. D.
The Place of Sex in Life.....Constance Long, M. D.
A Study of Human Motives.....John MacCurdy, M. D.

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The Function of Repression.....	John MacCurdy, M. D.
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Auto-Eroticism.....	Horace W. Frink, M. D.
Analysis of Charlotte Brontë.....	Lucile Dooley, M. D.
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Extending the Field of Conscious Control..	Wm. White, M. D.
Labor and Health.....	Leland Olds
Inner Conflict and Social Unrest.....	Mr. Corey
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giene	Dr. Richards
Maladaptation and the Neuroses	Edith Spaulding, M. D.
Delinquency as a Reflection of Certain Social Settings,	
.....	Bernard Glueck, M. D.

BOOK NOTES

Mind and Conduct. By HENRY R. MARSHALL. N. Y., Scribner, 1919. 236 p.

Here the author has gathered together in a single volume the discussion of certain problems relating to human conduct to which his attention has been turned in the course of his psychological studies, and which were embodied in the Morse Lectures which he gave at the Union Theological Seminary. The first is on the Correlation of Mind and Conduct and discusses consciousness and behavior, instinct and reason, and the self. Part II is Some Implications of the Correlation, under which heading he discusses creativeness and ideals, freedom and responsibility. Part III, which treats of Guides to Conduct, takes up pleasure and pain, happiness, intuition and reason. There are two appendices, the causal relation between mind and body, and outer-world objects.

Natural Food and Care for Child and Mother. By SUSAN HARDING RUMMLER. Chicago, Rand McNally, 1919. 298 p.

This work is based on the belief that whereas each new human being is in a measure a law unto himself, there are certain fundamental principles of right living which are true for all. These are: (1) Nature may be approached but never surpassed; (2) Nature presents a law, kind and forgiving, although in the main immutable; (3) obedience to the laws of Nature tends towards Health and Happiness; (4) disobedience to the laws of Nature brings unnatural results, even disease and death. So we have the following parts: The Prenatal Care; Care of the New-born Infant and Mother during Confinement; The First Year for the Baby and Mother; Artificial Feeding; Weight, Growth, and Normal Development; The Second Year; The Child from the Age of Three to Ten Years; Dietetics and Recipes; and Miscellaneous. The book is very practical, for the author is a Ph.B. and the mother of four children.

The Psychology and Pedagogy of Anger. By ROY FRANKLIN RICHARDSON. Baltimore, Warwick and York, 1918. 100 p.

This is number 19 of the Educational Psychology Monographs edited by J. Carleton Bell. The substance of it was originally presented as a Clark thesis. After an introduction, the author considers in four chapters the following topics: Mental Situation Stimulating Anger, Behavior of Consciousness, Disappearance of Anger, and Educational Function. He appends an interesting bibliography that is well up to date. The merit of this work consists in the many original records kept mainly by a number of friends of the author of their own experience with anger, not so much of clonic outbreaks as of the fainter irritations and mild chronic indignation that is so common to some temperaments.

The Blind. Their Condition and the Work Being Done for Them in the United States. By HARRY BEST. N. Y., MacMillan, 1919. 762 p.

This is a very excellent and much-needed work for we have no comprehensive study in this field to date, and the author has been painstaking and conscientious. We only regret that he refrained from entering the international field, and still more that he did not take more account of the new work done for the blind occasioned by the war.

The book is divided into seven parts, as follows, each subdivided into many chapters: General Condition of the State; Blindness and the Possibilities of its Prevention; Provision for the Education of Blind Children; Intellectual Provision for the Adult Blind; Material Provision for the Blind; Organizations Interested in the Blind; and Conclusions with Respect to the Work for the Blind. There are valuable appendices listing the schools, homes, and industrial establishments for the blind.

Verse for Patriots. Comp. By JEAN BROADHURST and CLARA L. RHODES. Phil., Lippincott, 1919. 367 p.

We have lately awakened to the consciousness that there are those among us who are not of us, and we shall probably make larger demands for teaching patriotism. It cannot be exactly put into the curriculum as a required subject, for this leaves the student cold. Neither could the appeal be too direct because youth rejects such an attack on his emotional nature. The best way to secure patriotism, then, is to stir the imagination. Just this the authors attempt to do, much of the book consisting of verse describing thrilling deeds of individual heroes. The idea is certainly excellent and timely, and its execution seems to be worthy of the spirit that prompts it.

American Leaders. By WALTER LEFFERTS. Phil., Lippincott, 1919. 329 p.

A score of Americans are grouped here in three rubrics, viz., those who helped to make our country independent, those who helped to make it strong, and those who helped to make it larger. The stories are well-told, but there are perhaps a couple of dozen illustrations of a rather modest not to say cheap order. The idea, however, is an excellent one, although it is a far less ambitious attempt to give biography the importance it demands in the school than various other efforts. The names are well-chosen. We ought to have more and better books of this sort.

Christ as a Teacher. By JOHN W. WAYLAND. Boston, The Stratford Co., 1919. 70 p.

This little book is made up of seven talks to normal students and teachers of Sunday schools. The topics treated are Truth and Method; His Method; His Aim; The Matter of His Teaching; His Pupils; His Life; and His Consciousness of a Mission. The author does not differ so much as we should expect, or hope, from the stock treatises in this field. It is very orthodox. While to our thinking there is a very tempting opportunity for various original contributions and very effective work to be done under this title, the author's pedagogy is far more good than great.

Applied Economic Botany. By MELVILLE THURSTON COOK. Phil., Lippincott, 1919. 261 p.

This book is based upon actual agricultural and gardening projects and contains one hundred and forty-two illustrations. It is in the Farm Life Text Series edited by K. C. Davis of Cornell. Although there are many treatises on botany, this is somewhat unique and in a sense fills a vacant field by being practical. The first part is devoted to plant life and the second to the most important families of economic plants, with special exercises. The effort is to give Botany again a new and better place in our educational system.

Deficiency and Delinquency. An interpretation of mental testing. By JAMES BURT MINER. Baltimore, Warwick and York, 1918. 355 p.

The work contains twenty-two tables and nine figures, and the book is divided into two parts, (1) practical, and (2) theoretical considerations. Under the first the chapters treat of the function of a scale in diagnosis, the percentage definition of intellectual deficiency, what percentage is feeble-minded, adapting the percentage definition of the Binet-Simon, testing deficiency, checking the Binet diagnosis by other methods, school retardation among delinquents, a comparison of school tests and the Binet tests, etc. Part II treats of the theory of the measurement of mental development and quantitative definitions of the border-line life. An interesting bibliography of tested delinquents is appended.

Education in Ancient Israel to 70 A. D. By FLETCHER HARPER SWIFT. Chicago, Open court, 1919. 134 p.

Most treatises on Hebrew education in English are very out-of-date or inadequate, and the author of this book thinks his is the first attempt to give education in Israel the broad treatment that has been accorded to the education of other ancient peoples. In no people was this problem so difficult.

The book consists of six chapters, viz: The Native or Pre-exilic Period; Education During the Native or Pre-exilic Period; General Survey of the Period of Reaction to Foreign Influences, 586 B. C. to 70 A. D.; Education in the Family after the Exile; Education in School and Society after the Exile; and Woman and the Education of Girls.

Hidden Treasure. By JOHN T. SIMPSON. Philadelphia, Lippincott, 1919. 303 p.

This is a novel with a purpose, viz., to incline boys to stay at home on the farm. It describes the youngster, Bob Williams, coming to work for his uncle on an old farm which the latter had started by the old methods, and bringing with him enthusiasm and imagination enough to search for "hidden treasure" there. The boy, who had had a year at agricultural college and kept in touch with the latest bulletins on the subject, was constantly suggesting new ideas, at first violently repudiated by his uncle, who was somewhat skeptical of new methods of doing old jobs. A sandpit which heretofore everybody had used freely, Bob made a source of income by charging fifty cents a cubic yard for the sand. As a railroad was being built, they made a great deal of money in this way. His next step was to bargain with the contractor to dig a ditch, build a new dam and a new road. He had the pond drained and converted into a productive income-yielding cornfield. A progressive banker loaned money, and a manufacturer of tools decided to help him in making it a model farm. The final step in the regeneration of the old place was the building of a

new house and barn, to say nothing of the installing of electric lights, etc. At the close of the book a city girl, who has visited the farm during the summer, becomes infatuated with both farm life and the hero of the story, and they marry and have a very prosperous farm of their own.

The story element of the book is meagre and clumsy, but the interest of it lies in the fact that it describes all kinds of new processes and machines until the reader feels that he could manage a model dairy, put up concrete stables, and all the rest.

French Educational Ideals of Today. By FERDINAND BUISSON & F. E. FARRINGTON. *Yonkers-on-Hudson*, World Book Co., 1919. 326 p.

It was realized at the International Congress on Education at Oakland, California, in 1915 that although the systems of France and the United States were animated by a common inspiration, they were ignorant of each other's purposes and ideals. To bring home French ideals to us the editors have selected and printed extracts from between thirty and forty prominent French writers on different educational topics which are believed to present French ideals in general and to some extent special problems.

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